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DECEMBER 1937

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BRITISH PRICES WEAKEN

GERMAN OIL IMPORTS TO INCREASE IN 1938

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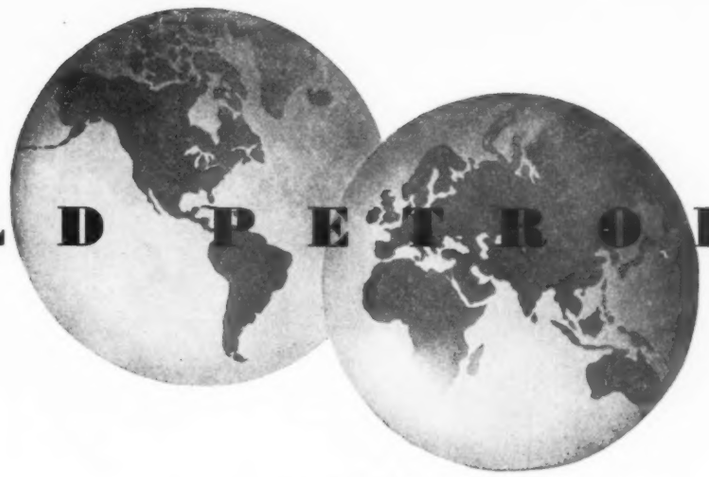

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RUSSELL PALMER
Publisher

E. W. Mayo
Editor

T. Orchard Lisle
Executive Editor

E. W. Mayo, Jr.
Managing Editor

S. J. Gallay
Advertising Manager

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PETROLEUM'S POSITION STRONG INTERNATIONALLY

WHILE the oil business in the United States cannot expect to escape the effects of a prolonged business recession most of the industry's members feel that it is in a strong position to withstand any temporary decline in the domestic consumption of its products. Close students of the market anticipate in fact no actual decrease in distribution but more probably a halt in the swift rise in demand that has taken place during the past two years.

During 1936 the consumption of gasoline in the United States was 481,591,000 bbl., an increase of 10.5 percent over the preceding year. During nine months of 1937 demand has amounted to 1,433,000 bbl. daily, a gain of 20 percent over the daily rate in 1935. It was not to be expected that a gain of 10 percent yearly could be maintained indefinitely. Even though the drop in sales in recent weeks seems to have been something more than seasonal the volume of business remains greater than it has been at the corresponding period of any season prior to the current one. On November 1 more than 29,000,000 motor cars were registered in the United States, almost 3,000,000 more than in 1935, and it is safe to say that most of these will be in operation in 1938.

It must be borne in mind that the oil business is international. It is the world demand as a whole that measures activity and prosperity in petroleum. The present slump in trade appears to be confined largely to the United States and to be attributable to causes operating within the country. Elsewhere industrial activity is unabated and the demand for petroleum products continues to grow. Despite the increase in output in other parts of the world exports from the United States for the first nine months of the current year have been 33 percent greater than in the corresponding period of 1936 and more than double their 1935 value.

On the very day in late November when Washington authorities were consulting anxiously over ways and means of staying the decline it was announced in London that British business during the first ten months of 1937 had attained the highest volume in eight years, that the country's foreign trade had risen nearly 25 percent over the previous year and that the prevailing opinion was that the recovery was based on sound conditions and would continue. In Germany, despite the development in synthetic fuel production, imports actually have increased instead of declining. In the international picture there is no sign of any slowing down in petroleum trade activities.

During the past two years the demands put upon the oil industry have increased at such a rate that extraordinary activity in exploration and drilling has been necessary. Even with some let down in the heavy pressure of demand the industry will need to keep up the pace of its activities in exploration, drilling and refinery construction in order to maintain the service which the world has come to expect of it. Manufacturers of field and refinery equipment, with contracts in hand that will keep them fully occupied for six months to a year and with fresh orders from all parts of the world coming in to replace those that reach completion, see nothing disheartening in the outlook for 1938.

Current developments, however, emphasize the need for caution in certain particulars.

Should there be an appreciable falling off in the estimated consumption of motor fuel during the winter season gasoline stocks may rise considerably above 80,000,000 bbl. and become a threat to the stability of prices. Appreciation of this situation is being shown by state proration officials in reducing allowables and taking other steps to hold production within bounds. If this course is maintained and if refiners work to keep gasoline stocks from becoming too unwieldy the industry has little to fear in 1938.

Aztec pyramid of the Sun and Moon, characteristic of ancient civilization in Mexico.

MEXICO Concludes Important Oil Contracts

Mexican Eagle Company Gets Operating Control of Poza Rica and Other Fields by Sharing Output With Government. Centralamer, Ltd., Becomes a New Factor in Situation. American Companies May Be Left in Embarrassing Position.

ANOTHER kaleidoscopic turn in the ever uncertain Mexican oil situation has taken place during this month of November with the announcement that the government has granted to El Aguila (Mexican Eagle Oil Co.) extensive concessions in rich Vera Cruz fields under conditions that are quite without precedent. No premonition of this action had leaked out. Resident oil men who try to follow events closely were taken completely by surprise. Even now conflicting opinions are expressed as to the causes responsible for the grant and as to what it portends.

The agreement, which is to be effective from November 1, covers extensive holdings in the Poza Rica, Poza de Cuero and Troncones y Potrerillo fields, all in the state of Vera Cruz. These are considered three of the most promising fields in Mexico. Poza Rica, where Mexican Eagle has been active in development for the past two years, is rated by many geologists as the most important addition to international production since Iraq. It is producing about 63,000 bbl. daily or more than half of Mexico's total output. Out of nineteen wells drilled its proven area has fifteen producers fourteen of which belong to Aguila and one to the government.

While the Aguila company's concessions covered most of the Poza Rica field the government, through its National Petroleum Administration had certain holdings within these areas. (The beds and banks of navigable waterways in Mexico are specifically classed as part of the federal reserve). An intensive drilling campaign on these government properties would have compelled Aguila to put down a large number of offset wells, thus impairing the best economic development of the field while at the same time containing possibilities of unpleasantness in the relations between the two parties. From the viewpoint of the Aguila organization the contract just closed is looked upon as a pooling agreement such as oil companies frequently make with other leaseholders for the orderly development of their combined holdings. In support of this view it is pointed out that in the area where the federal holdings and the company's concessions adjoin it is provided that each party shall be permitted to operate 48 wells and that these wells must be located three-quarters of a kilometer (2436 ft.) apart in order to assure economic operation.

The contract provides that as to 66 plots on which Aguila holds confirmatory concessions the government is to receive 35 percent of the gross output and as to 35 others it is to receive 15 percent. While the company's claims are confirmed and extended a proviso is included that it must withdraw suits that it had pending in relation to certain areas and several such suits have been withdrawn.

El Aguila must keep three drilling units in operation in the Poza Rica district. It must start drilling within the first year of the agreement in the Poza de Cuero belt and within five months in the third area. If it fails to drill or abandons locations the subsoil rights or uncompleted wells revert to the government. The company must pay all the costs of exploration and exploitation, must provide transportation and must use modern methods and equipment in its drilling operations.

During the coming five years the company must supply to the government 12,580 bbl. of crude daily. If this quantity is not forthcoming from the area covered by the concessions it must be supplied from other producing wells of the company. As explained by the company's representatives the arrangement is a simple one of mutual convenience. Each party is to drill its own zones, Aguila on its concessioned land to which it is given a clear title and the government in the federal areas, each party paying its own costs, the company giving the government a participation in its output rather than a royalty and both having the advantage of a unit development of the field and avoidance of litigation. The deal was not arrived at suddenly, it is pointed out, but comes as the culmination of eighteen months of negotiation and the agreement actually was completed as long ago as last May but was held in abeyance for six months on account of labor troubles.

To one who is at all conversant with the history of the Mexican oil industry during the past twenty years it need not be stated that this agreement presents several remarkable features. The arrangement by which the government receives 35 percent of gross output from wells located on private concessions, whether it be described as royalty or otherwise, is without precedent and would be quite beyond the capacity of a company operating under ordinary conditions or in fields less prolific than Poza Rica.

Another unusual feature of this deal is that it marks an exception to the policy heretofore followed by the present Mexican administration in questioning and attacking the concessionary rights of foreign-owned companies. A third is the contrast

it affords in the treatment accorded to American and British operators. The Mexican Eagle Company, as is well known, is a subsidiary of the Royal Dutch-Shell group. Only a day before it received this signal mark of governmental favor a decree issued by President Cardenas nationalized 350,000 acres under lease to the Standard Oil Company of California and its subsidiary, Richmond Petroleum Company. As to part of this property the reason for confiscation stated in the decree was that the Mexican Supreme Court had pronounced the company's claim illegal although in reality the court had confirmed the concession only about a year ago. As to another part, the decree stated that the holder of the lease, the Richmond Petroleum Company, was financed by a foreign company, Standard Oil of California, contrary to Mexican law. The flimsiness of these pretexts is pointed out as indicating how little attention the government feels it necessary to pay to the rights of American companies.

One serious aspect of the arrangement made with the Mexican Eagle, from the viewpoint of other companies operating there, is its effect upon the position of "confirmatory concessions." This is the term applied to claims existing prior to the adoption of the constitution of 1917 which were still to be confirmed. By an agreement signed by U. S. Ambassador Morrow and President Calles some ten years ago no taxes higher than those originally charged prior to 1917 were to be assessed against these concessions. The terms fixed in the case of El Aguila may be cited by the government as a precedent and demands may be made upon other companies to enter into similar arrangements which, as previously stated, would be quite beyond the ability of companies operating in less productive areas.

Officials of the Aguila company state that the agreement has no bearing on the status of confirmatory concessions in general but some of the Mexican newspapers hail the contract as a great victory for the government and infer that other oil companies will have to make similar arrangements if they expect to continue doing business in Mexico.

Certainly the contract greatly strengthens the hands of President Cardenas. It puts the government in possession of a large and steady supply of oil which presumably will be increased as the development of the fields concerned makes further progress. Oil is money and will provide the Cardenas administration with funds to carry on its plans for the socialization of Mexico which otherwise might have had to be abandoned for lack of revenue.

Another project which came to public knowledge at the same time when the Aguila concession was granted may throw further light on the plans of the government for dealing with the petroleum situation. This is a proposal put forward by a British syndicate, Centralamer, Ltd. to make a loan of £1,000,000, to the Mexican government and to invest another £1,000,000 in drilling wells in federal reserves, building three refineries and aiding in the construction in British shipyards of ten steamers for coastwise service in Gulf and Pacific waters. The loan is to be repaid through oil supplied by the government either from its own wells or from royalties.

According to reports cabled from London the plan has been worked out in detail and American firms have been asked for bids on the erection of the three refineries, two of which are to be of 6,000 bbl. daily capacity and one of 8,000 bbl. They are to be located at Mexico City, Tuxpam and Tampico. It is said that contracts have been made for the sale of government owned crude and of products of the projected refineries, sales to be handled through Lambert and Bendall Ltd., London oil brokers, and distribution, in part at least by Stevinson Hardy & Co., oil suppliers and operators of bunkering stations. While refined products from this source cannot be produced before the end of the coming year it is expected that crude will be available within a few months and it is reported that this will be sold largely in Continental and Canadian markets.

According to current reports the wells to be drilled by the National Petroleum Administration, acting for the Mexican government, under the agreement with Centralamer, Ltd. will be located mainly in the Panuco and Isthmus fields but some few of them may be in the Poza Rica area.

Centralamer, Ltd. was registered in London as a private company on November 18, immediately following the acceptance of the contract by the Mexican government. Its stated purpose is to acquire lands, mineral and other properties, mines, mining and other rights. The chairman of the board is Stanley H. Lambert. Managing Directors are W. S. Bendall and D. A. Thomas. Another director is H. M. Pratt. Messrs. Lambert, Bendall and Pratt are all directors of Lambert and Bendall Ltd. Mr. Thomas who is now on his way to Mexico will be resident manager in charge. He is also managing director of Intercambio Commercial S. A. de L. which was organized here earlier in the year to handle the deal. While first reports from London stated that a British banking house was financing the operation later despatches are to the effect that other than British interests will provide the financing and that no public offering of shares is anticipated.

While it is stated that the Centralamer contract is entirely separate from the Aguila agreement one report here is that the government will devote 60 percent of the oil received under the Aguila deal to carrying out the Centralamer agreement.

Some apprehension is being caused among American companies operating here by the reflection that the deals made by the government with these two British groups will provide a supply of petroleum products sufficient for domestic needs and consequently may cause the authorities to take a more arbitrary attitude in dealing with other companies. Officially the statement is made that the contracts just concluded have no bearing upon the position of companies other than those directly concerned, but it is pointed out by outside observers that applications for drilling permits which American companies have had pending, in some instances for two or three years, never have been acted upon.

STATE DEPARTMENT Taking No Action

WASHINGTON, NOVEMBER 30

WHILE the State Department is watching the Mexican oil situation closely it has made no representations to the Mexican government regarding recent grants to British interests which are viewed in some quarters as a violation of the Morrow-Calles agreement. No request for any such action has been received thus far from any American oil company and no eivdence is before the Department of any intended discrimination against American companies by the Cardenas administration.

This is the substance of replies by State Department officials to inquiries put before them. While no definite initmation was given as to the Department's future course the inference might be drawn that if and when it appeared that such discrimination was being practiced action might be taken. It was pointed out that in the past American oil companies operating in Mexico had been satisfied to fight their own battles and to seek protection of their rights, when necessary, through the courts of that country. The obvious deduction was that attempted interference, before the need for it clearly appeared, might prejudice the position of American interests and render it more difficult for them to obtain recognition of their rights to certain properties which were understood to be the subject of negotiation at the present time.

CAN MARKETING Produce More Profits?

By Paul Ryan

Ryan, Leach and Goode, Sales Engineers

Analyzing the Causes Behind the Failure of Marketing Departments in Some Companies to Show Profits Commensurate with Returns from Production and Pipeline Departments — Some Companies, Regardless of Size, Have Profit-Minded Management.

ANY unbiased survey of the present marketing situation in the oil industry indicates that most of the troubles afflicting this division of the industry have been primarily due to two causes:

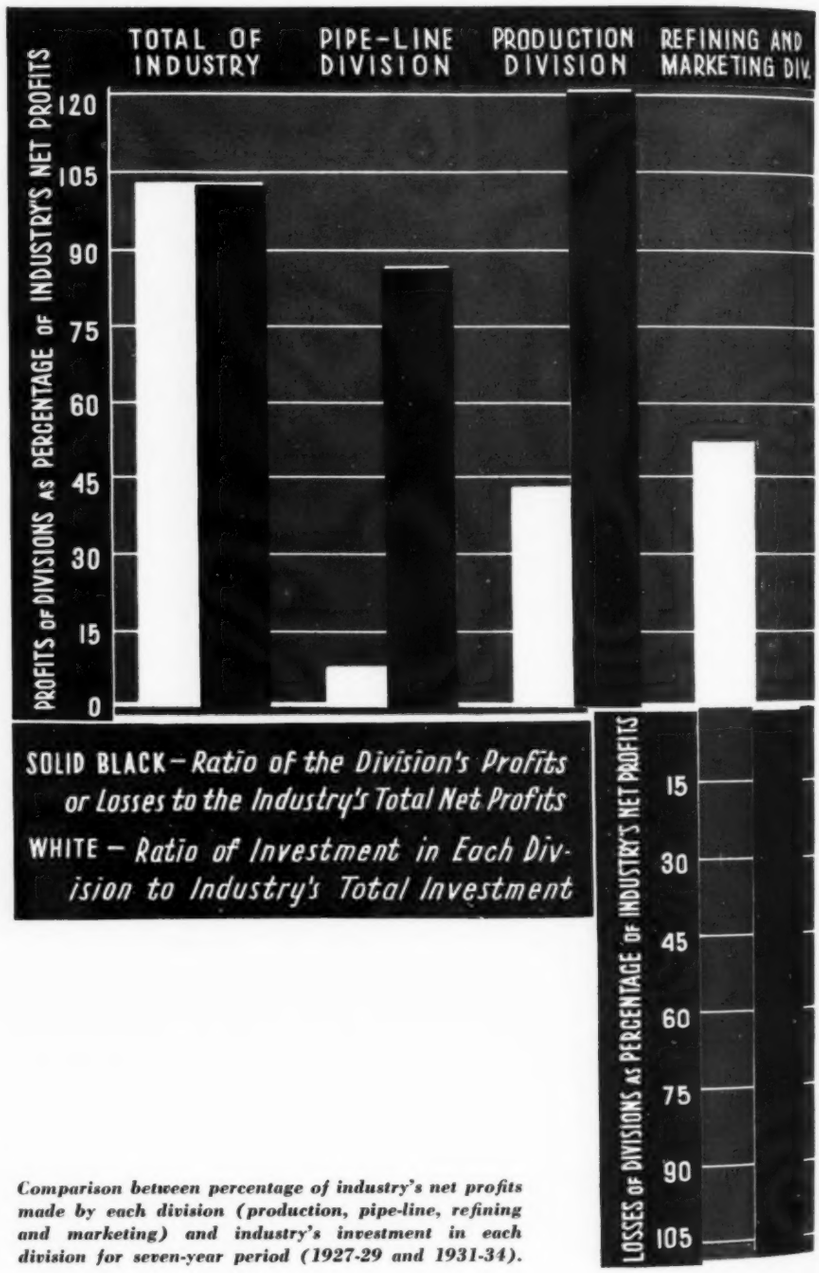
1. Placing sales emphasis on gallonage rather than on profits.
2. Considering marketing organizations merely as outlets for the maximum amount of crude oil that the companies could draw from their wells and push through their refineries.

Have these unfortunate appreciations of the marketing functions arisen from the fact that most of the top executives of the major oil companies have come primarily from the production, financial and legal branches of the industry, with very few having their major business experience in the refining side, and fewer still in the sales side of the business?

Marketing departments of most companies can achieve more profits, if their problems would receive the same sympathetic understanding by the same calibre of executive ability as has made the industry triumph over its other difficulties.

Recent years have emphasized the importance of the sales division of the petroleum industry. Successful operation of an oil company demands adequate production with satisfactory reserves, good refining equipment, and economical transportation facilities. But, at the point of sale, the petroleum products are converted into cash, which is the lifeblood needed to keep any business going. It is possible for an oil company to buy crudes of various grades from many sources. It is possible to buy refined products from individual refiners (although the complaint now being faced by the large companies is based on their purchase of excess stocks from refiners who could find no other outlet for them). No oil company, however, can buy customers and have them delivered to its door, as it can purchase and receive crude and its products.

The customer is the ultimate dictator of the oil industry. Oil company customers must be attracted and built up (if possible) into permanent supporters of the business by the company itself, through its sales representatives, its jobbers and its dealers. A human relationship must be established with these human beings—the customers—



Comparison between percentage of industry's net profits made by each division (production, pipe-line, refining and marketing) and industry's investment in each division for seven-year period (1927-29 and 1931-34).

in order to produce a sales volume profitable to the dealers and the company. To produce such profitable results requires a guiding intelligence in the management of the company, more expansive, more human and more sales-minded than is necessary to handle the material products in their successive steps from the field to the tank car or bulk station.

The history of the oil industry is a record of successful accomplishment and of triumphs over difficulties. The application of the same degree of analytical, intensively-intelligent managerial direction on marketing problems will achieve success and profits for the oil companies in marketing just as success has been achieved in production, transportation, refining and finance.

Let us look at the past history of the industry as a whole—from the profit point-of-view. Here are two tables showing the investment in various phases of the business and the earnings of these various divisions.

Investment in U. S. Oil Industry By Divisions

Division of Industry	Dollars Invested	Percentage of Industry's Dollars
Production	$5,665,000,000.	42.7
Pipe-line	941,000,000.	7.1
Refining	3,670,000,000.	27.6
Marketing	3,000,000,000.	22.6
	$13,276,000,000.	100.0

Data through courtesy of Young Management Corp., New York: "Oil Attains Prosperity." Nov. 28, 1936.

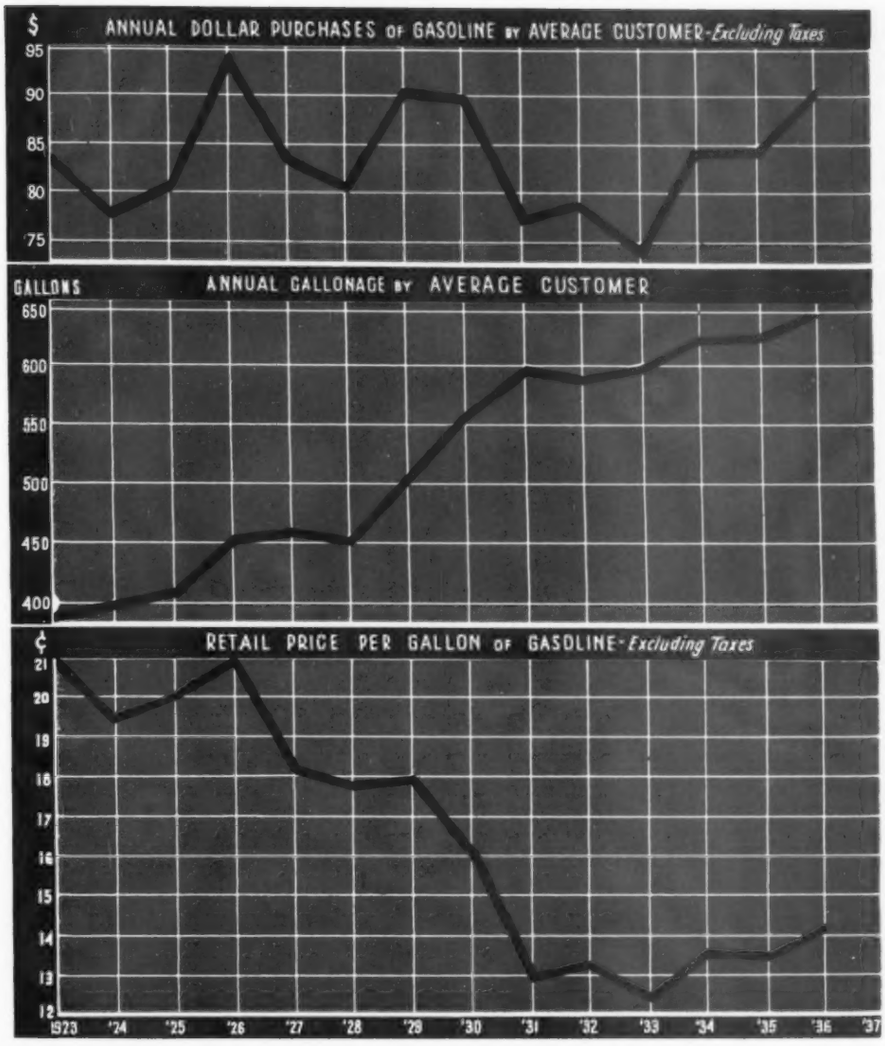
Let us now consider the earnings of the industry by divisions. (See Table 2.) Data on earnings of pipeline companies are obtainable from their reports to the Interstate Commerce Commission; the data on the earnings of the production phase of the industry come from cost studies of the United States Tariff Commission from 1927 to 1929 and from the Petroleum Administrative Board from 1931 to 1934.

This table shows that, for a period of seven years for which data are available, the production and pipeline divisions of the oil industry produced on the average more than twice the total annual net profits of the industry; the refining and marketing divisions' losses cut these profits in half.

In other words, if the refining and marketing divisions could operate merely on a break-even basis, the oil industry's profits would more than double.

These tables indicate that, for the period shown, the pipeline division having only 7.1 percent of the industry's investment produced 86 percent of the industry's total final net profits; the production division having 42.7 percent of the investment produced an additional 120 percent of the final net profits giving a grand total of 206 percent of the industry's net profits; and the refining and marketing divisions having 50.2 percent of the investment on the average, produced a LOSS equal to over 106 percent of the industry's final net profits.

These data cover five good years (1927-28-29 and 1933-34) and two poor years (1931-32) and come from sources deemed reliable. In three of these five good years, the refining and marketing divisions showed a loss; production showed a loss in one year, and the pipeline in none.



While statistics for the current year, if they were available, probably would show a better balance, the conditions indicated above should be remedied quickly—and by the oil industry itself, or the pending Biermann legislation, to divorce marketing activities of oil companies from production, refining and pipeline divisions, may gather sufficient public approval to become a law.

It is an encouraging fact that after the industry's outstanding executive ability has so successfully established the facilities to supply the gasoline demand, recent emphasis on the sales side has shifted from this problem of providing an adequate number of outlets—there are now admittedly too many—to the problem of making these outlets profitable. The service era is past; the profits era has entered into marketing.

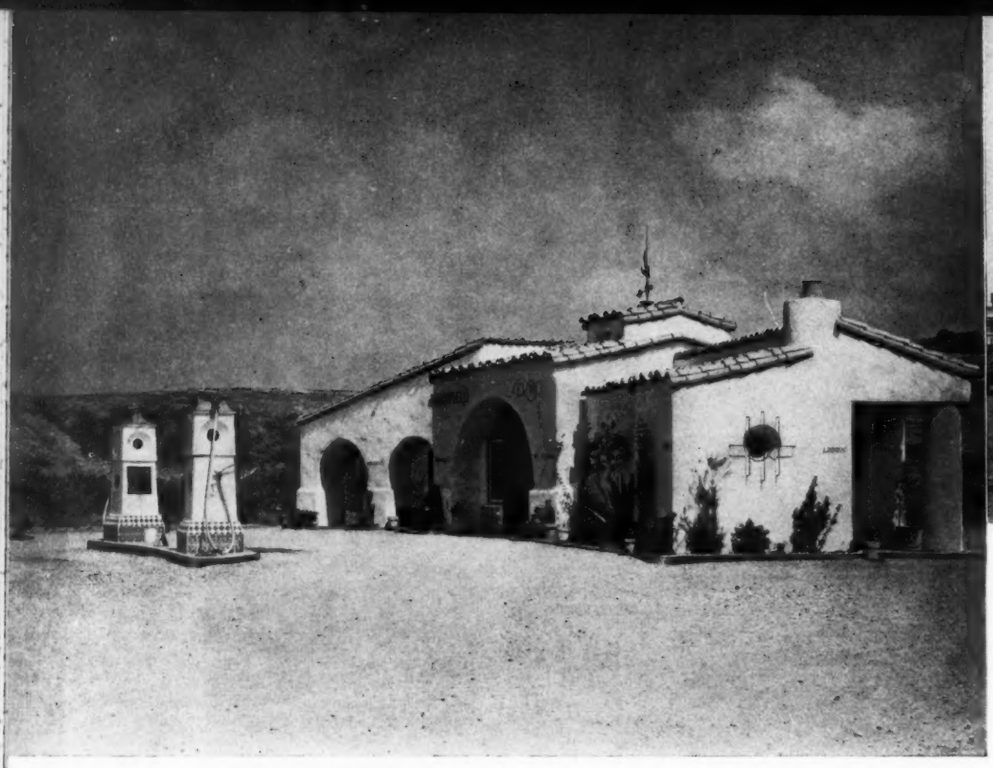
It would be hard to imagine the head of General Foods Corp. declaring, "Our sales department exists solely as an outlet for

TABLE 2

INCOME OF THE PETROLEUM INDUSTRY BY DIVISION AND BY YEARS

Year	Production Gross Profit (Unit $1,000.)	Percentage of Industry's Net Profits	Pipe-line Net Income (Unit $1,000.)	Percentage of Industry's Net Profits	Total Profit Production & Pipe-line (Unit $1,000.)	Percentage of Industry's Net Profits	Net Profits of Industry (Unit $1,000.)	Refining & Marketing Profit or Loss (Unit $1,000.)	Percentage of Industry's Net Profits
1927	$198,248	190.0	$ 93,239	89.3	$291,687	279.2	$104,324	d $187,163	—
1928	171,280	44.3	117,206	30.3	288,486	74.6	386,516	98,030	25.3
1929	352,563	77.2	142,216	31.1	494,779	108.2	456,495	d 38,284	—
1931	d 120,853	—	120,738	—	d 115	—	d 333,903	d 333,788	—
1932	128,766	—	112,362	—	241,128	—	d 182,400	d 423,528	—
1933	62,490	30.6	105,943	51.9	168,433	82.6	204,000	35,567	17.4
1934	287,857	108.8	84,143	31.9	372,000	140.8	264,000	d 108,000	—
Average	$154,342	120.2	$110,836	86.0	$265,216	206.2	$128,434	d $135,744	d105.2

d means deficit. Data through courtesy of Young Management Corp., New York: "Oil Attains Prosperity." November 28, 1936.



© W. W. Robinson

Types of the attractive but inexpensive service station developed on the Pacific Coast. Stations such as these serve the main interest of profit-minded management where gallonage is secondary to sound operation of the company as a unit.

our production of Jello and Maxwell House Coffee. The sales department is not expected to make a profit; it just moves our tonnage, and does whatever is necessary to keep it moving."

The idea that the head of General Foods, or any other company, would make such a statement, is ridiculous. But, these very words (with changes of names) were spoken to me recently by a major sales executive of one of the largest oil companies. With such an outlook, the oil industry can hope to make itself profitable only with the greatest difficulty, for the sales department could waste money—and has done so—faster than the production, pipeline and refining departments can earn it.

The only reason for the existence of any sales department is to increase the net profit of the company by helping to get more money for the products, after deducting the sales department's expenses, than the company could get without such help. If the sales department's expenses are so high that the company gets less money than it could get without the sales department's help, then the sales department is failing in its responsibility.

The size of this net profit figure determines the effectiveness and the profitability of the sales department's operations.

The accompanying tables seem to indicate that the production and pipeline departments at times have been hard-pressed to make enough profit to counterbalance the losses shown by the refining and sales departments. Refining technique has greatly reduced its costs, so the stigma of wasting the industry's profits falls apparently on the marketing department. Perhaps, the philosophy of the sales executive, as outlined above, is one indication of the real reason.

What can the sales department do to correct this situation? The chief executive of the company can make his entire organization—and particularly his sales department—profit-minded.

There are various kinds of management:

FIRST: The financial-minded, that applies the dollars-and-cents yardstick to everything, is usually extremely cautious, against any change, keeps interminable records, makes repairs instead of replacements, and conducts a penny-wise-and-pound foolish policy.

SECOND: The volume-minded, that emphasizes—gallonage, more gallonage,— forgets that selling costs for an increasing volume frequently increase more rapidly than the volume, wants only more gallonage regardless of the type and number of dealers, regardless of the costs of getting the gallonage or of servicing it, and is always looking for new dealers instead of developing the ones it already has.

THIRD: The price-minded, that thinks in terms of price only, that does not sell any dealer on becoming a customer but buys its business with cut-prices, longer margins, and extra concessions (that are really cuts in price) that fails to stress quality, experience, public good-will toward the company, or service in helping the dealer to mange his business better and make more profits, that forgets that a reduction of 10 percent in the price may reduce the net profit by 50 percent.

FOURTH: The product-minded, that thinks always in terms of new developments for the product, new ways of making the product superior in performance, then neglects to teach its sales personnel and dealers how to present the sales story about the superiority of the product to the public, and is so wrapped up in its product developments that it fails to realize that the best product is worth no more than the average product, unless its superiority is sold to the public.

FIFTH: The profit-minded, that provides for the ever-present hazards of business, that recognizes the certainty of change and the need for progress, that budgets its operations to estimate its income and expenses and to produce profits, that trains and stimulates the human elements in its organization, that satisfactorily discharges the responsibility for coordinating all the activities of the organization to develop each to its fullest degree, economically, effectively and profitably.

Ordinarily, one takes for granted that a company's organization is profit-minded: that is as it should be. But the daily actions of each member of the organization are influenced by matters of personal judgment, by lines of authority in the organization, by precedent and practice, by personal enthusiasms, by inevitable differences of opinions, by unfortunate personal rivalries, and by the intensive concentration of an individual on the difficulties of his own particular task—all of which tend to distract the organization, as a whole, from its one fundamental task of coordinating all its activities to produce profits.

Let us compare the profit-activities of the major companies, for the year 1936, and for preceding years (1928-36). Let us remember that in the year 1936, in almost all industries, the buyer sought the supplier with good prices for commodities and operating expenses pruned low for few years, profits were inevitable for most companies. Nineteen thirty-six proved a banner year for the oil industry.

The major companies have been divided into four groups, as follows:

1. Those doing an annual business in excess of $400,000,000.

2. Those doing an annual business from $200,000,000 to $400,000,000.
3. Those doing an annual business from $100,000,000 to $200,000,000.
4. Those doing an annual business less than $100,000,000.

The charts on pages 30- 31 divided as noted above, show two items:

1. The "cost of goods and expenses," which includes cost of products, cost of manufacture, selling expenses, overhead and general administrative expenses. It does not include depreciation and depletion, nor any financial charges.
2. The "net profit" which remains from the operating income, after deducting depreciation and depletion and all financial charges, but before dividends.

Charts 2, and 3 present data from the annual reports of these companies for the year 1936 and for the period from 1928 to 1936. This latter nine-year period includes six good years and three poor years.

The quarterly earnings records for 1937 that have so far been released by some companies indicate a general improvement in profits over 1936, but emphasize that the better-managed profit-minded companies are still doing better than their competitors.

In general, that management, which keeps its total cost of products and expenses below 80 percent of its gross income, has a good chance of showing a profit at the prices prevailing during the last several years.

These charts point to several conclusions:

1. Size of the company or volume of business is no indication of the ability of the management to produce profits. Some companies such as Standard of Indiana, Phillips, Standard of California and Ohio Oil make not only a higher percentage of net profit than companies several times their size, but in many cases even make more actual dollars of net profit than these larger companies.

2. Adequate supplies of owned crude production are no guarantee of high profits, although they do help. Good management can, however, make profits in spite of the lack of adequate production.

Phillips and Continental, among the major companies, currently produce more than they refine, while Standard of California, Gulf, and Pure Oil all produce better than 80 percent of their refinery requirements. Standard of Indiana, on the other hand, according to the latest available data, is one of the major companies lowest in percentage of owned crude production to refinery runs, producing only one-third of its requirements; it is, however, one of the companies achieving a consistently high record of profits, in spite of its lack of owned production.

Sales to the aviation industry illustrate a situation where possible profits are sacrificed in some instances for advertising of undetermined value.

Standard of Ohio has no production whatsoever; it operates only refining and marketing divisions. Its earning record over the years has been quite satisfactory, surpassing competitors of its own size and comparing very favorably with competitors of any size. Standard of Kentucky has no production or refining; it only markets, and continues to earn satisfactory profits. The other major companies produce from one-third to two-thirds of their crude requirements; no correlation can be made to validate the assumption that increasing the "ratio of production to refinery runs" automatically increases profits.

3. Extending the marketing activities of an oil company over wide geographical areas on a national scale does not produce the economies or profits which large-scale operations frequently produce in other industries, if one is to judge by the earning records of the various oil companies.

The most consistent records of satisfactory net profits have been made by Standard of Indiana, Standard of California, Phillips, and Sun, all of whom confine their marketing activities to natural trading areas of those states close to their refineries. On the other hand, Socony-Vacuum, Texas, Consolidated, Shell, and Tidewater-Associated have been able to achieve profits but not in the same ratio to total volume of business, perhaps because of a lack of the flexibility. which their localized competitors possess enabling them to take quick advantage of their opportunities.

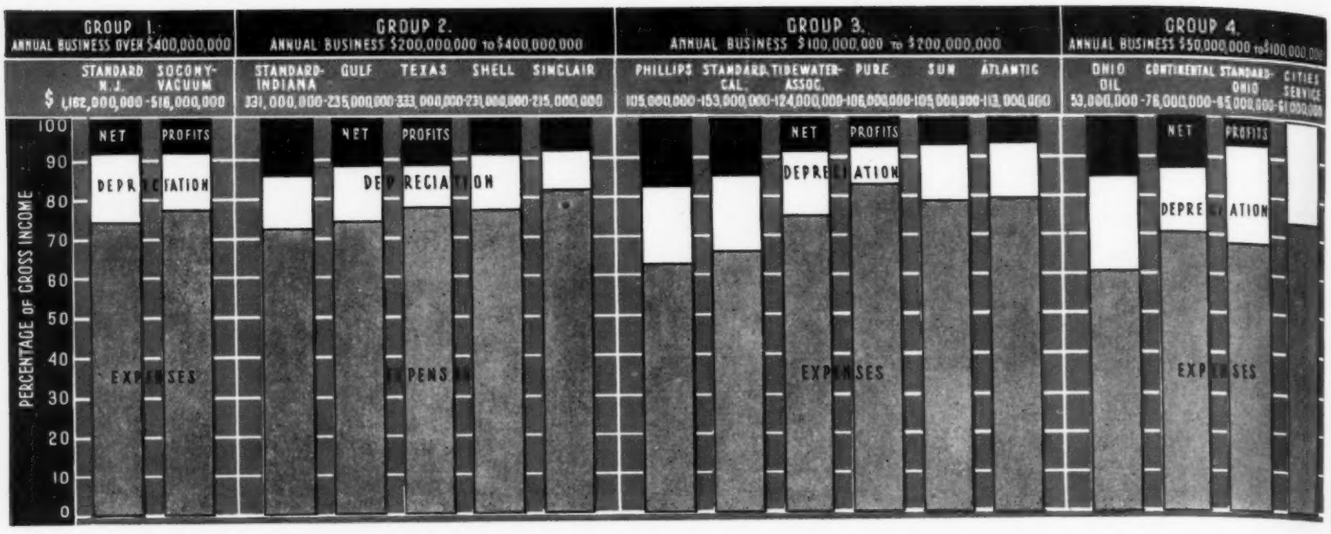
Apparently, profit-minded management can achieve satisfactory profits, almost in spite of any obstacles. Such management produces these profits by eliminating unprofitable gallonage and stopping costly marketing practices.

One of the best examples of profit-minded management is that of Mr. Dan Moran, president of Continental Oil Company. In his 1936 annual report to his stockholders, he told of giving up to his competitors over 30,000,000 gal. of gasoline business in 1935 and over 11,600,000 in the first six months of 1936. His total gallonage each year barely increased, while the industry increased its gallonage over ten percent. But Mr. Moran's profit-minded management increased the profits of Continental Oil Company for 1935 over 1934 by over 83 percent and for 1936 over 1935 by almost 10 percent. Other companies similarly increased their profits, but not with such dramatic emphasis on profits at the expense of gallonage. And Continental is not one of the largest companies; it does less than $100,000,000 per year, and has flung its operations over many states; it still makes profits.

Phillips Petroleum, too, has employed its engineering background to apply to marketing problems a searching analytical determination to subordinate gallonage and all else to the making of profits. In 1936 it converted over 17 percent of its gross sales into net profits. That record was unequalled by any other company. Other companies such as Standard of Indiana, Standard of California, and some more have achieved outstanding results by placing greater emphasis on profits.

Price per gallon of gasoline constitutes an important function of the profits of oil companies. Yet, price per gallon is only one of several elements of vast importance; annual consumption per car and the total dollars paid per customer per year are equally important.

Chart on page 27 shows relationship between price per gallon, average annual



The charts on this and the facing page show in gray the percentage of gross income represented by expenses which include the cost of goods, selling and administrative expenses; depreciation, depletion and all financial charges are shown in white; net profit is shown in black. Companies are divided into four groups: Group 1, doing an annual business of $400,000,000 or more; Group 2, an annual business of $200,000,000 to $400,000,000; Group 3, an annual business of $100,000,000 to $200,000,000 and Group 4, doing an annual business between $50,000,000 and $100,000,000. The chart on this page applies to the year 1936 only. The chart on the facing page applies to the period 1928 to 1936 except Standard of Ohio and Continental, figures for which are given from 1929 to 1936, Standard of Indiana, from 1930 to 1936, Cities Service, The Texas Co. and Socony-Vacuum, 1933 to 1936, and Standard of California figures for which are given from 1934 to 1936.

gallonage per car, and total annual dollars paid per car. It shows that although the price per gallon has declined over the past 15 years, the average gallonage per car has continuously increased, making each customer worth about the same amount in total dollars per year to an oil company.

It is unlikely that price per gallon will increase greatly in the immediate future, but annual consumption per car seems destined to continue its increases. The emphasis in marketing then should be placed upon getting all, if possible, of any one customer's gallonage, so as to obtain all, if possible, of the dollars that customer spends on petroleum products.

Regardless of price declines, if not too great, a company can continue to make its present profits, if it gets all the business of each customer. The actual operation of such a plan places the responsibility upon the sales management of each company to make each dealer a capable business man who will accurately represent the company and give each customer eminently satisfactory service, so that he will continue to patronize the service stations of only that company's dealers.

Wise marketers are realizing that profits come from making a fair deal with the jobber or dealer, then continuously educating their own sales personnel to train these jobbers and dealers and closely supervise their activities to help them make profits.

These dealers need help and they want it. They want some employee of the oil company, who knows the oil business and who understands their problems, to help them find profitable solutions for these problems. And their main problem is to make more profits. The company needs these dealers—needs them to represent the company properly to those customers who buy the company's products. The public's opinion of the company is no better than the public's opinion of the dealer who serves the public. The company may say, "That is not our service station; that is a dealer!" But the public makes no such distinction; that dealer is the company to the public.

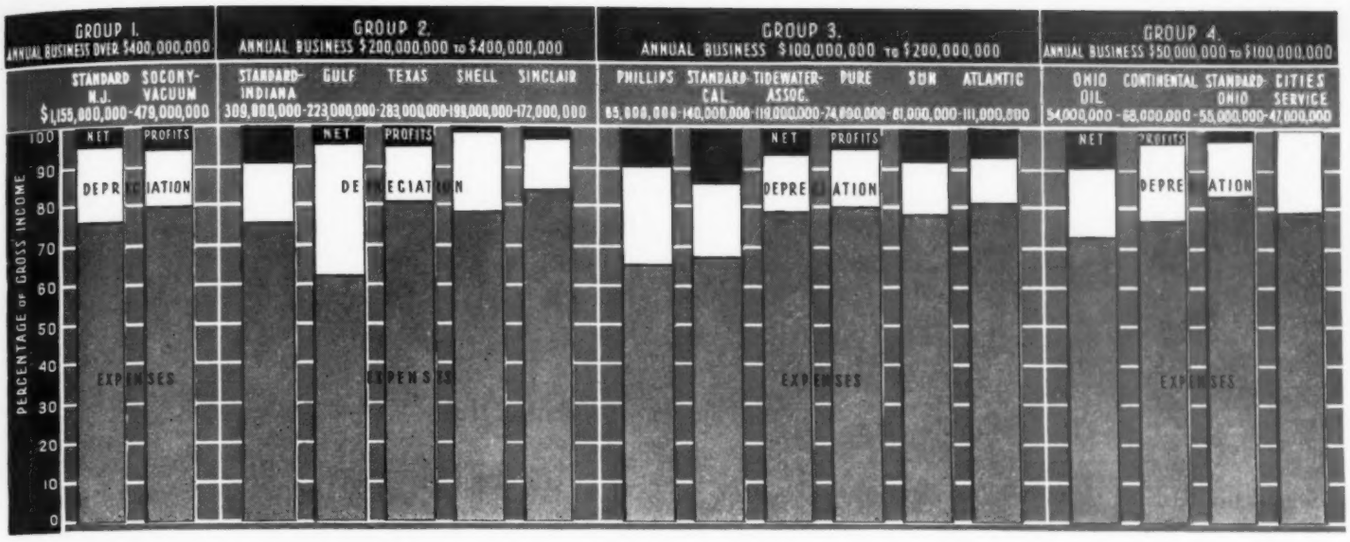
What then can a company do to increase its profits, dependent as it is, to a great extent, upon dealers representing the company to the public? There are many things which profit-minded companies are now doing, as follows:

1. Coordinating all of their sales elements—merchandising, advertising, publicity, public relations, market research, sales promotion and personnel training—so that all of them focus with maximum effectiveness at the point-of-sale, to produce, through their united action, many times more sales and profits than they could produce separately—and at greatly reduced expense. Such teamwork is vastly more profitable than a series of individual un-coordinated efforts. Physical facilities, and their operations—production, transportation and refining—have been well coordinated, but less frequently has the same thought been applied to the sales facilities—men, advertising and sales promotion. Such coordination forces every dollar of expense for sales and advertising to team together to produce a maximum profitable return at minimum expense.

2. Reducing operating expenses as much as possible below 80 percent of the sales income. Every percent reduction in cost of goods and operating expenses for major companies will increase net profits by 10 percent, at present cost and profit levels. A reduction of three percent, for example, in cost of goods and operating expenses will increase net profits 30 percent—and no department head would state that he could not save three cents out of each dollar he is now spending. A study of the charts reproduced herewith will identify those companies which are now making profits by keeping expenses down.

3. Stopping the feverish activities to get new dealers, and instead helping to build up the dealers the companies now have. It is agreed that there are three ways to get more gallonage—taking dealers away from competitors, promoting new outlets, or building up the present dealers.

One of the largest of the major companies reports that in the first nine months of 1937 in one of its districts, where it has 21



good salesmen, it signed up exactly 19 new accounts—an average of less than one new dealer per man for nine months work. This experience is duplicated by other companies. The reason is that good dealers are not readily available.

The promotion of new outlets is expensive and difficult (since most good locations are presently occupied) and merely dilutes still further, the present reduced gallonage per station.

The most profitable method of increasing gallonage is to develop the present dealers to make profits for themselves and for the company.

4. Spending as much time on developing sound constructive merchandising plans as has formerly been spent on evolving devious ways to make trick leases or on devising new forms of concessions or cut-price arrangements with dealers. This constructive work will help the dealers to sell the company's products for the company; the other kind of effort spends the company's money to buy the dealer's business, and does not help him resell the company's products.

Continuous replacements by the oil companies of good equipment with newer equipment in dealers' stations, to get a dealer signed up, is an ascending cycle of expense; as human beings, the more the dealers get, the more they will ask for—unless a company takes a definite stand that it will not replace any dealer's present satisfactory equipment with streamlined gadgets, but will spend that amount of money to work continuously with the dealer to help him make more profits with the equipment he has.

The Texas Company certainly deserves commendation for its recent announcement of its plans to stop these costly practices. The imitation of Texas' lead would prove profitable to other oil companies.

Profits can be materially increased by eliminating price-cutting in any form—as extra concessions to dealers, longer rentals and secret extra margins, payment for advertising privileges, or lowered tank-wagon prices—a cut of one cent per gallon, even on present good prices, may throw away 50 percent of the possible net profit of the company.

5. Building up the human relationship between the company and the dealer, and between the dealer and the company's customer is another important factor. The company should humanize its contacts with its own personnel and its jobbers and dealers, and do everything possible to train and supervise and stimulate these jobbers and dealers, so that their contacts with the public will produce the maximum profit for the jobbers and dealers and the company.

Changing from company-operation of service stations to dealer-operation has not eliminated the necessity for training and supervision and stimulation; on the contrary, it has greatly increased it and yet simplified it. When the service station salesmen were on the company payroll, the company could issue instructions, and, by intensive policing, see that the instructions were followed; the orders were obeyed—or else. Loss of his job was the usual form of external urge used on the employee.

Now, since dealers operate the stations, this attitude has been forced to give way to an intelligent selling of ideas by the company to the dealers, so as to obtain the dealer's cooperation in the sales programs. The external urge—a policeman's club—has been changed to an internal urge; the desire of the dealer to make profits for himself causes him to cooperate with the company and makes him want to do what the company wants him to do. The promotion of such an 'internal urge' requires the skillful use of trained sales personnel of the company to obtain the confidence, respect and cooperation of the dealers.

Some companies have appointed distributors to operate their facilities for them and handle all dealer contacts for the company; this trend has increased somewhat in recent years. It offers the advantage of limiting the company's loss on its marketing operations to the margin per gallon allowed the distributor; any extra loss the distributor suffers out of his own pocket. It relieves the company of the legal responsibility for marketing activities, of any nature, that the distributor might conduct. It further passes on to the distributor the responsibility and the expense of supervising the company's dealers.

Those apparent advantages are the most serious weaknesses of the whole plan. The desire to limit the company's loss is wise, but there are other and constructive ways of achieving that end; the elimination of normal business risk by the company, also, to a great extent eliminates the opportunity for profit by the company. If the distributor must take the gamble for the loss, he is naturally going to do those things which pay him the most profit—regardless of its effect on the company's profit. The only possible course for the company to pursue is to supervise closely the activities of the distributors—who are handling the good name and the good-will of the company—

(Continued on page 56)

BRITISH GASOLINE Price Structure Weakening

By Alec H. Day

EVENTS since the July reduction in British motor spirit prices have completely justified the change. Possibilities of a further price cut have now been brought into the foreground by lower Gulf quotations and a substantial reduction in tanker freights. The situation is not affected by a temporary increase in freight rates since the first of November, as this increase was due principally to a shortage of certain loading dates. When the national companies surprised the country at the end of July by paring ½d. per gallon from posted prices, leaving first-grade spirit at 1s. 7d. per gallon, the world oil position seemed to some British observers to be proof against a set-back. Much publicity had been given in previous months to a sharp rise in freights including those for the transport of oil. Gulf prices were steady, and the summer demand for motor spirit was at its peak.

Lower selling prices established at that time were attributed by the companies to a decrease in laid-down cost, a summary of the position which was accurate at the time, and has since proved to be prophetic.

Gulf prices for gasoline weakened appreciably between end of July and the beginning of November. If 64-66 degree spirit is taken as the basis of a comparison, the sterling price was fully 3.6 d. per Imperial gallon at the end of July, and 3.4 d. at the beginning of November.

Meanwhile, tanker freights have continued their decline, which was already in progress in the summer until the temporary increase early in November. Clean tonnage from the Gulf was quoted early in October at around 22s., against 30s. in July. Costs of freight and other charges, which were then calculated at 1.3 d. per Imperial gallon, can now hardly be put higher than 1.0 d. Total laid-down cost, therefore, including the 8d. duty, has declined during the past three months or so from 12.9 d. to about 12.4 d.

On the basis of a selling price of 1s. 7d. per gallon for first-grade spirit, this computation seems to leave an ample margin of profit, but 1s. 7d. has never been an effective quotation from the importers' viewpoint. Even where this figure is obtained, it is subject to the margin of the retailer, while a considerable percentage of the motor spirit sold in Britain consists of commercial grades, retailing at 2d. below No. 1 quality.

Moreover, a very large amount of motor spirit business is covered by contracts at much lower quotations. Average selling prices over the whole trade are therefore far below the No. 1 quotation. From the remaining profit over import costs, handling and blending costs have to be met. In addition, the larger companies, at least, spend considerable sums on testing and research, which are really a charge against the margin between laid-down cost and selling prices.

Since the cost of importing spirit from the Gulf has come down from 12.9 d. to 12.4 d. per gallon since July, there is some reason behind the talk of possibilities of another reduction in prices charged to the consumer. A reduction of ½ d. per gallon would still leave values ½d. over the quotations in force a year ago, when No. 1 spirit stood at 1s. 6d.

Major interests in the British market, deriving motor spirit from their own fields and refineries, and operating their own tanker fleets, could doubtless make a profit after cutting prices by ½d. per gallon. Importing and distributing concerns in the position of having to buy spirit and pay for transport might also make a bare margin over outgoings.

Small margins, however, are more remunerative now than they were a few years ago, owing to the steady increase in turnover. Motor spirit entered in Britain for home consumption during the first nine months of the current year amounted to 28,700,000 bbl., compared with 27,300,000 bbl. in the corresponding period of 1936 and 26,400,000 bbl. in 1935. This year's figure is 5.1 percent above that for 1936 and 8.7 over the previous year.

Expansion of turnover thus indicated must mean a reduction in overhead charges per barrel, and corresponding improvement in earnings from importing and distribution

Whether it pays to rely entirely on consumption for increased profits has always been an open question in British oil discussions. Two opposite schools of thought have been apparent at times within recent years. One holds that selling prices should be kept reasonably above import costs, with a consequential higher profit margin, and the other believes in allowing retail prices to be influenced entirely by the laid-down cost, with only a bare profit over that figure.

Oil publicity in Britain in recent years has taken care to emphasize the time and money spent by oil companies in providing the highest possible quality of motor spirit. There are those who hold that, as a result of this publicity, the excellent services rendered by distributing companies are so widely recognized that a slightly higher profit margin is possible.

Organization of oil companies has at the same time attained a high pitch of efficiency, and a large part of the resulting saving of costs has so far been passed on to consumers. A good case can be made out for retention by industry of part of these advantages in the form of a larger spread between import cost and selling prices.

Opponents of this view of profit margins quote past experience as a reason for keeping motor spirit prices in close conformity with world conditions. While contract prices for the sale of motor spirit in bulk are influenced to some extent by retail prices, the connection is apt to loosen when the latter are too far from laid-down cost, owing to the intense competition for contract business. Similarly, when standard selling prices are too high, the major companies are apt to lose business of all kinds to smaller competitors.

These are the main arguments for keeping retail prices for motor spirit completely competitive by adjusting them immediately to changes in import values.

The national group of companies are in an excellent position to control the market with this end in view. Not only their predominating position in the market, but the fact that they are their own suppliers and transporters, makes price adjustment a relatively easy matter for them.

Recent price adjustments in the motor spirit market have indicated clearly that the policy of small margins and close correspondence between laid-down costs and selling prices has been adopted. This was demonstrated forcibly when the last price reduction was made in July.

Since that time, business in motor spirit has remained active, but rumors have been current again of the possibility of a new entrant into the British market. While lacking any definite evidence, these rumors tend to impose caution on established distributors in the fixing of selling prices.

For this reason alone, prices are likely to be kept well in line with world conditions, and the immediate outlook for the market thus depends largely on the course of Gulf prices and tanker freights.

GERMANY — Oil Importer of Growing Importance

By Dr. Norbert Lauffs

Third Largest Customer in 1936, Despite Appreciable Domestic Production of Gasoline, Germany Will Show a Definite Increase in Oil Imports in 1938 Over Previous Years.

EXCEPTIONAL fact in regard to the German oil situation is that imports of oil are actually increasing at this time.

Much has been written about German plans to render the country independent of outside sources of petroleum supply. Of late, these articles have concentrated on the measure of success already achieved, notably through the construction of coal hydrogenation plants (*vide* WORLD PETROLEUM, Refinery Issue, p. 59: Synthetic Petroleum and Economic Autarchy). However, the great increase in consumption, resulting from measures designed to stimulate the purchase and use of motor cars has created a situation where even greatly increased domestic production, and the use of synthetic fuels, is inadequate to meet present demand without imports in excess of previous recent years.

The measures taken and still being taken to cover the mineral oil demand, must often appear unintelligible to the industry in other countries. Germany's mineral oil policy is greatly influenced by external events, such as her being outside the actual mineral oil market. One will have to take into consideration such factors in order to be able to appreciate fully the measures taken.

German economic policy is today definitely influenced by the following factors: form of foreign trade, and international payments; measures of national economic nature; and economic reflections in which all future possibilities are taken into consideration. It will be necessary to give below an abbreviated account of these factors.

Germany's foreign debt in 1932 was not less than 22 milliard marks, owing to the effected reparation payments. The amount of interest and amortization could in Germany's case only be payed by obtaining a favorable balance of trade. The value of German foreign trade in 1932, however, was only 9 milliard marks, and apart from this, imports and exports were about equal.

There followed a period when the value of imports actually exceeded that of exports and the German government was compelled to restrict imports in an effort to obtain a sufficient trade balance to make possible payments on the foreign debt. As imports in proportion to exports are still unsatisfactory (taking into consideration Germany's international obligations) restrictions on imports have become more numerous and extensive and today cover nearly all commodities which can be produced or for which there is a substitute in the country. In spite of this the value of German imports has risen by 22.3 percent from January-June 1933 to January-June 1937.

Germany's import restrictions have often been the subject of severe criticism. It is pointed out that larger German orders abroad would have brought larger foreign orders to Germany. Those now in charge of German national economy, however, state that this rule had already failed with regard to the 22 milliard marks.

The economic policy of nearly all countries is nowadays greatly influenced by nationalistic aims. This attitude is especially dominant in Germany at the moment. The measures taken are now much more decisive than in countries where concessions to economic autarchy have been the usual practice for a number of years. Such a program of national self-sufficiency has been stimulated in Germany as a result of difficulties encountered in obtaining exchange for the purchase of goods produced abroad and also as a result of her sad experience with regard to supplies during the Great War.

It is a typical phenomenon in German industrial life, that all possibilities, favorable and unfavorable, are reckoned with. Thus in Germany far more than in other countries the question arises as to how long the world's oil supplies will last. It is expected, that it will not be long before oilfields involving higher working expenses will have to be taken into production. Careful consideration has therefore been given to the possibility of a decisive reduction in cost of producing oil from coal. Considerable study has been devoted to the utilization of by-products and remarkable results have been achieved in many respects, especially with regard to pit-coal.

It is necessary to take into consideration all these factors influencing German economic policy, in order to understand the measures taken regarding the mineral oil market.

Germany is the fourth largest mineral oil consumer among those countries which are dependent on imports and will in all probability during the current year move up to the third position, which is now held by Canada. The most important consuming country is Great Britain, whose consumption last year was 11,300,000 metric tons. Second is France with about 6,000 000 tons and third Canada with 5,400,000 tons. Germany with a consumption of 5,100,000 tons is a close fourth. The ratio of the

© Dr. Paul Wolff

Careful testing is characteristic of the German petroleum industry.

Gasoline recovery plant in Germany with the steel derricks of the Nienhangen field in the background.

three European countries was therefore 100: 53: 45. Corresponding figures of 1933 were 100: 59: 31. These figures reflect the exceptionally favorable development of the German mineral oil market during recent years. Germany's oil consumption has nearly doubled within the last four years. Doubtless this upward development will now slow down a little, but at the moment there are no signs of a slackening in demand. On the contrary it can be almost positively predicted, that Germany's petroleum consumption will exceed that of her European neighbor before long. Thus the first part of the year 1937 shows a marked increase in consumption—on the average, last year's figures were exceeded over 10 percent. A consumption of 5,800,000 to 6,000,000 tons for the whole year may be anticipated.

In the first place, German oil consumption is dependent on the pace of motorization of the country. The increase in numbers of newly licensed vehicles has in no other country been so large as in Germany. In 1932 the number of newly licensed passenger cars in the United States amounted to 27 times the figure for Germany: but in 1936 it was only 16 times that of Germany. Registration of new commercial vehicles in the United States was 26 times that of Germany in 1932 and fell to 14 fold in 1936. In 1936 Germany rated as the fourth largest motoring nation.

MOTORIZATION

A 98 percent increase in the number of passenger cars and an 87 percent increase in commercial vehicles since 1932 is the best proof of the progressive motorization of Germany. Moreover mileage per car shows a considerable gain amounting to a four to five fold increase of traffic in nearly all cases.

On July 1, 1937, 2,848,466 motor vehicles exclusive of units belonging to the army were counted in the annual census. This compares with 2,474,591 units in 1936 and 1,633,297 in 1932. Figures for 1932 contained a much larger proportion of motorcycles than in the current year. Of the 1,633,297 vehicles in 1932 not less than 866,017 (over 50 percent) were motorcycles.

The number of passenger cars has nearly doubled since 1932 (from 561,042 to 1,108,433). The number of commercial vehicles has risen from 173,947 to 321,524 units. The increased use of heavy duty commercial vehicles is closely related to the completion of a large number of arterial roads. Profits from long distance truck transportation have increased beyond expectation, as a result of the construction of express highways. Not only lower costs but the possibility of higher speeds, is making truck transportation increasingly attractive to German manufacturers. It is to be expected, that with the completion of more arterial roads the number of heavy commercial vehicles and trucks will greatly increase.

The increase in general goods transportation in Germany is so large, that the State Railways do not look upon this development of road transport with the anxiety they did some years ago. That is the reason why nowadays commercial road transport in Germany is left, to a large extent, to private enterprise, only the tariffs being adjusted to those of the State Railways. The old dispute, highway versus rail, has vanished into obscurity, since rail and road are fully employed.

Considering these factors increase in consumption of light motor spirit is remarkably small, being only 65 percent. But in this respect several points will have to be taken into account, which have prevented an increase in consumption of light motor spirit corresponding with the increase in number of cars, or frequency in use respectively. The motor vehicles put on the roads since 1932 are on the average much lower petrol consumers than the older models. Of extraordinary importance, however, is the fact that Diesel engines have been introduced into the heavier commercial vehicles. On July 1, 1937, 39,434 commercial vehicles, 5,701 buses and 14,894 heavy duty tractors were fitted with Diesel engines. Last year's gas oil consumption by Diesel driven vehicles is estimated at 300,000 tons.

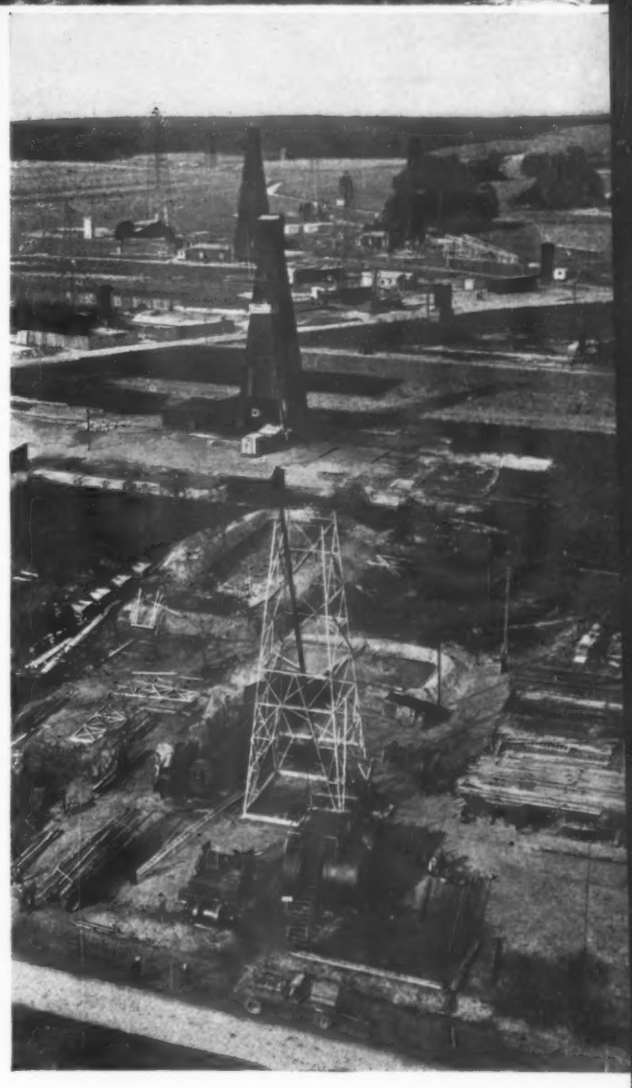
Besides this the conversion of many cars to the use of substitute fuels, such as gas distilled from wood and compressed gas must have influenced motor fuel consumption. It is estimated that at the moment 10,000 vehicles have been converted to the use of compressed gas (in steel flasks). This means a loss of 50,000 tons for the petrol market.

The losses sustained by the gasoline market have favorably affected the gas oil market. The 200 percent increase in consumption of gas oil from 1932 to 1936 is by far the most noteworthy section of the mineral oil consumption statistics. Unfortunately there are no exact figures to hand with reference to the number of stationary Diesels, which have become an important means of production in all industrial, agricultural, and other branches of industry. These stationary plants are responsible for more than half of Germany's gas oil consumption. It is certain that the total number of these Diesels as well as the working output of the individual units have increased considerably since 1932. This is not only to be deducted from the gas oil consumption, but also from the figures given by the German manufacturers of Diesel engines.

The Diesel motor is used in more than 90

GERMAN MINERAL OIL IMPORTS,
JAN.-SEPT. 1936 and 1937

Product	Quantity in tons		Value in 1,000 R M	
	1937	1936	1937	1936
Crude Oil	554,811	376,763	18,953	9,926
Gasoline	779,011	1,021,795	63,604	67,862
Kerosene	37,542	41,270	1,649	1,721
Gas Oil	852,573	779,171	35,211	26,972
Lubricating Oil	301,515	277,079	26,966	21,600
Fuel Oil	316,940	225,783	8,486	4,310
Residues	321,781	280,823	9,415	6,177
Asphalt	23,406	20,208	1,423	1,144
Total	3,187,579	3,022,892	165,707	139,712



Views of the great Nienhagen oilfield in Hanover, Germany.

percent of commercial vehicles over three tons. Over 50 percent of buses and tractors are Diesel driven. Some 30 percent of the two to three ton commercial vehicles are Diesel driven: under the two-ton limit the Diesel driven commercial vehicle is unimportant.

Important gas oil consumption also originates in the marine shipping trade. Last year's consumption was about 220,000 tons. This branch, having been greatly affected by the economic depression, consumed only 60,000 tons of gas oil in 1932. The increase therefore is not less than 270 percent.

Summing up the comparative changes, the result is a remarkably great increase in the use of Diesel engines and much of this development must be placed to the credit of the German Diesel manufacturers. They have improved the design and adapted the Diesel engine to a wide variety of purposes. This has had a most favorable effect on the export market for German Diesels, a fact that plays an important part in planning home production of motor fuels.

The slight decrease in consumption of kerosene is due to the fact that in Germany kerosene is only used for lighting purposes. Kerosene stoves and burners for cooking are nearly unknown because of the high duty on kerosene. Construction of new power stations with cross country distribution has led to a notable reduction in kerosene consumption as electricity is made more widely available for lighting purposes.

Consumption of lubricating oil reflects the upward trend not only of motor traffic, but also of German industry. Fuel oil consumption figures indicate activity in shipping, as practically the sole consumer of this petroleum product. German shipping bunkers large quantities of fuel and gas oils in foreign ports, which are not stated in German statistics. Also the refueling of foreign vessels in German ports is not entered in consumption figures given in the accompanying table. One would arrive at a far larger fuel oil consumption and therefore total petroleum consumption for Germany, if fuel oil purchased by German vessels in foreign ports was taken into account.

GERMANY'S MINERAL OIL IMPORTS BY COUNTRIES OF ORIGIN.

Country	Jan.-Sept. 1937	Jan.-Sept. 1936
Venezuela	1,152,273	1,082,066
United States	706,719	500,258
Roumania	445,388	663,399
Mexico	274,881	285,768
Russia	231,456	222,203
Netherlands India	90,810	72,439
Iran	97,762	65,526
Peru	106,044	49,853

Though the arterial roads are mainly built with concrete surfaces, the active road building elsewhere in Germany has led to an exceptional rise in asphalt consumption. Trebling of the requirements for this product since 1932 is the second greatest increase in mineral oil consumption in Germany after gas oil demand.

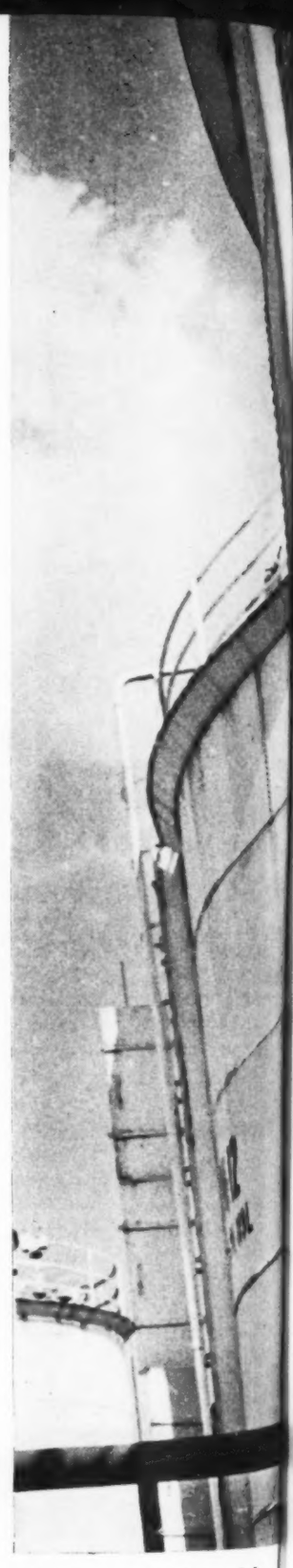
Exactly 10 years have passed since source of supply for the German mineral oil market began to take its present polymorphous shape. Previous to 1927 demand was covered mostly through the importation of refined products. Only a small quantity of lubricating oil and special motor spirit was refined from imported crude in German plants. Other German mineral oil supplies consisted of domestic benzole production, the quantity of which, however, was always dependent on the quantity of coke produced. German crude oil production, which at that time was hardly 100,000 tons per year, was used principally for the manufacture of cheap lubricating material.

OIL PRODUCTION

In 1927 the first hydrogenation plant went on stream belonging to I. G. Farbenindustrie located near Merseburg in Central Germany. In this year also a large quantity of alcohol for motor fuel was put on the market. This first hydrogenation plant has been followed by a number of others. There has also been a more extensive use of substitutes, of gas distilled from wood, increased exploitation of benzole and the rising use of alcohol and lately of methanol as motor fuel.

German crude oil production has shown a favorable development since 1921, the year in which the first deep well was sunk. At that time crude oil production was limited to 36,000 tons. In 1936, however, 446,000 tons were produced. Out of this domestic petroleum the following derivatives were manufactured: large quantities of lubricating oils and motor spirit, gas oil and fuel oil, small quantities of kerosene and asphalt. The most modern refining plant is at Misburg near Hanover, close to the most productive oilfields of Germany. Test drilling has been carried on in practically all parts of Germany during recent years, and in some cases shows interesting results.

As a result of the development of these sources and of orders issued by Herr Hitler in the autumn of 1936, Germany is well on the way to produce from domestic sources all light motor spirits required. If in the spring of 1938, (18 months after Herr Hitler's speech) light motor spirit should still be imported, it will be only to the extent of the additional demand having since occurred. Owing to the continuous increase in German motor fuel consumption one must reckon with the domestic production always lagging behind a little. On the other hand no arrangements have been made for extensive gas oil production in German hydrogenation plants. An important influence is found in the duty on gas oil used by Diesel engines being much lower than the duty on motor spirit.



Petroleum tanks of one of the great importing companies—Rhenania-Ossag—located at Hamburg: the facilities established by these companies have contributed greatly to the motorization of transport in Germany, but their future, under the German plan for self-sufficiency in gasoline supply, is uncertain.

GERMANYS MINERAL OIL CONSUMPTION
1932-1936

(In 1,000 metr. tons)

Product	1932	1933	1934	1935	1936
Gasoline	1,400	1,400	1,650	1,860	2,300
Special Motor Spirit	100	100	125	130	150
Kerosene	110	120	120	120	100
Gas Oil	360	473	650	850	1,130
Lubricating Oil	260	282	366	410	470
Fuel Oil	260	320	380	400	500
Asphalt	165	205	290	370	500
Total	2,655	2,900	3,581	4,140	5,150

Should the government, however, raise the tariff on gas oil, Diesel engine manufacturers would be the first to suffer, the value of their exports exceeding by far the value of imported gas oil.

IMPORTS

During the first seven months of the current year petroleum imports into Germany amounted to 2,342,403 tons, 163,386 tons or about 7.5 percent more than in the same period of 1936. Comparing this increase with the increase in total German imports, it is rather small. During the January-June 1937 period imports of all commodities showed an increase of 23 percent compared with those of imports during the same period in 1936. Imports of petroleum and products would show about the same increase, if imports of motor spirit were deducted. Motor spirit imported amounted to only 589,740 tons during this period in 1937 compared with 743,770 tons in the same period of 1936.

The value of all oil imports was RM. 120,180,000 in the first seven months of 1937 compared with RM. 99,640,000 in the same period last year.

Sources of Germany supply were Venezuela, Aruba and Curacao shipping 851,578 tons in the seven month period; the United States shipping 510,011 tons; Roumania with 403,377 tons, Russia with 178,590 tons and Mexico with 177,756 tons. Peru, Iran, and Netherlands India shipped about 60,000 tons each.

The decreasing importation of motor spirit indirectly reflects the growth of domestic production. In general the substitution of home production for imported gasoline passes nearly unnoticed by the consumer. One exception, however, is provided by the company Rheinpreussen of the Haniel group, which sells the petrol of the Haniel hydrogenation plants through a newly organized system of filling stations. Many of the distinctive petrol pumps, painted green and white, are to be met with in the west and southwest of Germany. Up to now the number of filling stations has not been increased as a result of marketing gasoline of domestic manufacture. At present Rheinpreussen, because of the restriction on construction of new filling stations, has limited itself to purchasing established outlets or to making arrangements with filling stations to sell only their products.

There is a question, however, whether this firm will long continue to be satisfied without extending the chain of purchased filling stations by the erection of new pumps. Moreover, it is known that the government has already made exceptions in the regulations regarding filling stations at least along the new arterial roads.

The importing companies cannot be expected to regard the development of Rheinpreussen's integrated organization indifferently. Importing companies are largely responsible for stimulating the upward trend of Germany's motor traffic through establishing a network of filling stations throughout the country and may expect some consideration for this contribution to German motorization.

© Philip Gendreau

Storage facilities play an important part in German petroleum plans: above, crude storage tank in a German oilfield; left, Shell-Werk tanks at Hamburg where imported oil is stored before distribution throughout the country.

CONCLUSION

In 1936 Germany was the third largest customer in the international oil market in spite of an increased domestic production of light motor fuels. In the current year indigenous production has been further increased, but Germany's imports have also risen. Next year imports of gasoline should reach a minimum; nevertheless, the total sum of mineral oil imports will increase. Germany will remain most important buyer on the world oil market. ■ ■ ■

NUMBER OF MOTOR VEHICLES IN GERMANY

(Figures from the annual census)

Unit	1932	1933	1934	1935	1936	1937
Motor Cycles	866,017	894,042	983,994	1,058,656	1,184,081	1,327,189
Passenger Cars	561,042	580,987	674,523	809,727	960,652	1,108,433
Commercial Vehicles	173,947	174,169	191,715	244,258	270,992	321,524
Other motor vehicles	32,291	33,787	37,400	45,170	58,866	91,320
Total	1,633,297	1,682,985	1,887,632	2,157,811	2,474,591	2,848,466

GREECE PRIMARILY A CONSUMER

Prospects of Commercial Output Slight

GEOGRAPHICALLY, Roumania is the logical source of Greek petroleum imports, but in 1936 it received a temporary setback due to its premium system and to the coincident satisfactory prices existing in the United States, which then became leading supplier of petroleum products. Greece imported about $3,110,000 worth of petroleum products from the United States in 1936, compared with about $1,450,000 in 1935. On the basis of volume, Roumania and the United States reversed positions for the single year. During 1935 Roumania supplied 75 percent in volume of Greece's petroleum imports—in 1936 the United States supplied about 71 precent of these imports. In total value Roumania, which supplied 56 percent in 1935, supplied only 21 percent in 1936; while the United States, which supplied 37 percent in total value in 1935, supplied about 75 percent in 1936. Greek import statistics for the first six months of 1937 are a direct contrast to the initial half of 1936, and Roumania has regained its natural position.

Greece's total imports of the four major petroleum products increased by about 254,000 bbl. and $360,000 in 1936. The first half of 1937 saw an increase of 26,969 bbl. in volume and $40,130 in value.

Virtual division of the Greek market between the United States and Roumania is made more evident when it is considered that between them they supply about 98 percent of the volume and 94 percent in value, and that the imports from other countries have been on the downgrade.

The kerosene market in Greece is extremely individual in its operation. Old Greece, the territory which was Greek prior to the Balkan War in 1912, has a government monopoly of the kerosene trade, while free trade exists in northern or new Greece. Competitive bidding is made for the contract to supply the monopoly by the various oil companies—supply was by Socony-Vacuum in 1935, by Royal Dutch-Shell in 1936, and by Socony-Vacuum again in 1937. Retail prices were on the same level in both territories during 1936, but were increased in new Greece early in 1937. It is estimated that kerosene sales increased by about 3.5 percent in 1936, the difference between increase in imports and in sales being accounted for by stocks.

The market for gas and fuel oils is steadily growing in Greece—particularly for the latter, which is sold principally by Royal Dutch-Shell, for use in oil burners. Indications are that even greater increases in fuel oil consumption are being effected.

Imports of gasoline reached a new high level, 492,610 bbl., in 1936. Sales were estimated to be about three percent higher than those of 1935, or about 510,000 bbl. This resulted in an appreciable reduction in stocks, which were low at the beginning of 1937.

Due to heavy stocks available in the first part of 1936, lubricating oil and grease imports declined in 1936. Importation of these products is free from countries with whom Greece has clearing arrangements. The larger oil companies continue to do considerable blending of these products locally to provide the cheaper grades necessary to meet the competition of the small operators, whose marketing expenses are low and who sell to taxi drivers and others primarily interested in price. Sudden increase in importation of German lubricants was noticeable in 1936, but in 1937 shipments from that country were on the decline. The annual consumption of lubricating oils is about 67,500 bbl. per annum, and stocks were lower at the beginning of 1937 than a year previous.

Imports of asphalt and bitumen into Greece declined in 1936, rising in 1937, although the share of the United States was doubled in the former year and was still larger during the first half of 1937. American asphalt is used in part for local manufacture of roofing materials. The Egyptian refinery of Royal Dutch-Shell is reported to be the principal source of Greek bitumen supply. Imports from Albania increased to third place, at 223 tons, in the first half of 1937.

Imports of paraffin wax have declined during 1936 and the first half of 1937, but the United States was able to strengthen its position by obtaining a greater proportion of the market. Late in 1936 the local wax merchants, who deal principally with the candle makers, organized themselves into a group for the purpose of pooling their interests. In spite of the reduced imports it is understood that large stocks are available. Importation of paraffin wax, formerly free from all countries, was transferred during 1936 to a different scheme whereby it has a global semi-annual quota of 900 metric tons. Imports may be effected from any country on basis of quotas allotted to individual importers.

Although there are about two dozen small importers of oil products in tins and barrels, the bulk oil business is almost entirely in the hands of five large organized companies: Royal Dutch-Shell supplies about 45 percent of the total while Socony-Vacuum has a 41 percent share; the Belgian concern, Socombel, takes third place at eight percent; Steaua Romana four percent; and about two percent is supplied by the Greek concern, National.

Prospecting for oil in northern Greece and the Peloponnesus was carried out in 1936 and drilling was undertaken at several points. The only existing producing area, Zante, has declined in output to only a few barrels of shallow production daily. Dr. Arthur Wade reported some years ago that he believed there were possibilities of more prolific production at a deeper level, but no drilling is known to have been undertaken to such depths. This concession belongs to D. Colaitis.

Two wildcats drilled on the concession of Thos. Bowen Rees within the past year were both unsuccessful. One, at Mesimvria, north of Salonika, was drilled to about 990 ft. while the other, east of Salonika near Anthophyton, went down to about 1,350 ft. but only encountered methane-bearing water.

The Markeglou concession, embracing the eastern tip of Greece up to the border of Turkey, has also been the scene of activity—one well drilled near Tavi was abandoned after reaching 2,282 ft. while a second, to the east of the same village, encountered saturated sandstone between 2,079 and 2,089 ft. It was decided to enlarge the hole and drill deeper.

Drilling is to commence on the concession of George Zographos, who has obtained the necessary exchange facilities to import drilling equipment from the United States. Surface geology already has been carried out.

During September, 1937, the government accepted bids for a concession in the Dragopsa district of Epirus, about a dozen miles west of Jannina, which is reported to be a good prospect.

The prospects of Greece as an entity are generally believed not to be considerable—it is conceded that oil does exist, nevertheless further discoveries are unlikely to meet even the domestic demand.

GREEK STATISTICS

Area: 50,270 sq. mi. Population: 6,830,000. Inhabitants per sq. mi.: 135.8.

Principal industries: spinning and weaving, tobacco, currants, sultanas, olives, cement, chemical fertilisers, iron, iron pyrites, magnesite, chromium, nickel, barytes, lead, bauxite, emery and talc.

Railways: length, 8,611 mi.; passenger traffic, 2,780,000; passenger-mi., 118,200,000; freight traffic, 1,310,000 tons; freight-mi., 73,800,000; locomotives, 217; passenger coaches, 220; freight cars, 4,282.

Highways: length, 7,619 mi.; area to mi. of road, 7 sq. mi.; vehicles to mi. of road, 1.9.

Motor vehicles: passenger cars, 7,000; buses, 2,080; trucks, 5,140; diesel powered, 280; total registrations, 14,500; population per vehicle, 472. Motor cycles, 500.

Merchant marine: 593 steamships of 1,792,953 gross tons; 13 motorships of 7,897 gross tons; total, 606 vessels of 1,800,850 gross tons.

Airdromes: Athens (Tatoi), Salonica (Sedes), Yannina, Corfu (Phaikion), Agrinion and Drama; subsidiary airdromes at Tanagra, Lamia, Atalante, Almyro, Ekaterini, Gorgope, Comotini, Missolonghi, Sarandapikon and Ziria. Airports: Athens (Phaleron and Nea Peramos), Salonica (Micra), Corfu (Phaikion) Mirabella and Candia (Crete); subsidiary airports at Patras, Mitylene, and Syra.

Aviation (domestic airline) 1936: planes, four; flights, 1,143; mileage, 203,942 mi.; passengers, 7,087; freight and mails, 307,155.16 lb. By eight non-domestic airlines: mileage, 569,808 mi.; passengers, 10,829; freight and mails, 1,482,092.16 lb.

Retail oil prices and taxes (U.S. cents per gallon, at Athens)—Gasoline (including duty of 18.7 cents and tax of 2.0 cents): ordinary, 35.6 cents in tins and 31.9 cents in bulk; premium, 42.3 cents in tins. Aviation fuel (including duty of 18.7 cents): 49.4 cents. Kerosene (including duty of 23.2 cents): in tins 37.5 cents, in bulk 34.5 cents. Lubricating oils (including duty of 15.9 cents): No. I, 99.9 cents; No. II, 66.6 cents; No. III, 54.5 cents. Taxes on kerosene and lubricating oils amount to less than one cent per gallon.

PETROLEUM CONSUMPTION IN 1936*

Product	Barrels
Gasoline	510,000
Kerosene	197,800
Gas and fuel oils	1,400,000
Lubricating oil and grease	67,500
	Tons
Asphalt and bitumen	8,800
Paraffin wax	1,900

*Unofficial estimate

COMPARATIVE VALUE OF IMPORTS FROM UNITED STATES, ROUMANIA AND TOTALS

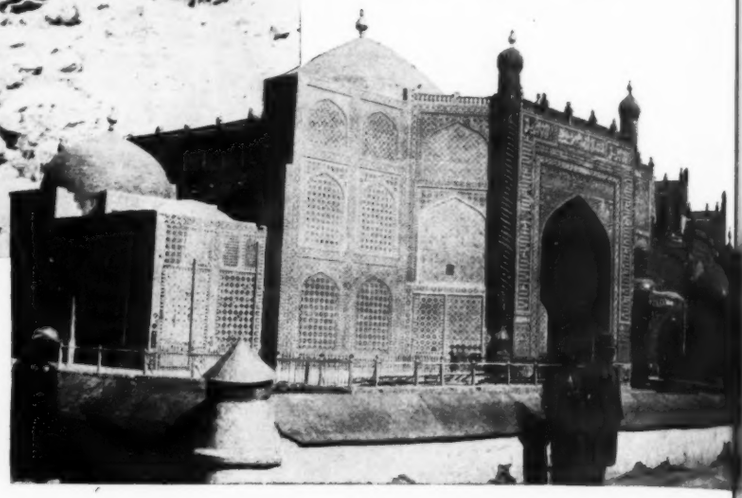
	UNITED STATES				ROUMANIA				TOTAL IMPORTS			
Product	6 mos. 1937	6 mos. 1936	Total 1936	Total 1935	6 mos. 1937	6 mos. 1936	Total 1936	Total 1935	6 mos. 1937	6 mos. 1936	Total 1936	Total 1935
Gasoline	$98,955	$475,518	$1,000,048	$491,095	$632,484	$125,866	$285,708	$692,923	$782,163	$612,846	$1,348,279	$1,241,131
Kerosene	23,958	3,785	62,503	35,716	102,744	121,514	107,128	196,218	126,702	122,211	169,651	241,083
Gas and fuel oils	169,839	851,591	1,669,723	312,515	1,073,709	254,773	473,737	1,224,763	1,243,548	1,081,323	2,142,960	1,535,788
Lubricating oil and grease	195,831	161,857	375,018	607,172	1,035	14,945	26,787	80,361	302,931	278,730	607,172	892,900
Asphalt and bitumen	*	*	*	*	*	*	*	*	*	*	177,553	200,656
Paraffin wax	*	*	*	*	*	*	*	*	*	*	114,587	203,117
Total	$488,583	$1,492,751	$3,107,294	$1,446,498	$1,809,972	$517,098	$893,360	$2,194,265	$2,455,444	$2,095,310	$4,560,202	$4,314,675

* Details not available.

PETROLEUM IMPORTS FROM ALL COUNTRIES, 1934-1937

Product and Country of Origin	First Half 1937	First Half 1936	Total 1936	Total 1935	Total 1934
		(Barrels)			
GASOLINE:					
Roumania	206,642	42,371	107,520	259,131	123,155
United States	34,540	173,605	370,006	193,105	153,040
Other Countries	11,676	7,237	15,084	19,284	84,587
Total	252,856	223,213	492,610	471,520	360,782
KEROSENE:					
Roumania	45,912	70,710	154,638	135,837	94,688
United States	10,050	1,876	31,414	19,206	48,195
Other Countries	.....	8	1,463	1,376	12,502
Total	55,871	72,594	187,515	156,419	155,385
GAS AND FUEL OILS:					
Roumania	595,697	143,559	301,230	877,784	496,864
United States	74,114	511,795	993,298	193,541	247,852
Other countries	.....	.....	6,817	3,040	210,688
Total	669,811	662,167	1,301,345	1,074,365	956,404

Product and Country of Origin	First Half 1937	First Half 1936	Tota 1936	Total 1935	Total 1934
		(Barrels)			
LUBRICATING OIL AND GREASE:					
United States	18,614	19,246	40,515	62,436	30,900
Germany	6,500	7,154	13,250	6,397	2,595
Belgium	3,134	655	2,280	2,517	2,002
United Kingdom	1,385	3,159	4,076	5,984	6,787
Roumania	110	2,012	4,073	12,630	10,538
Other countries	145	257	1,272	674	263
Total	29,888	32,483	65,466	90,638	53,085
		(Tons)			
ASPHALT AND BITUMEN:					
Egypt	1,936	1,292	6,936	7,518	1,431
United States	561	518	1,250	510	134
Albania	223	26	.....	.....	.....
United Kingdom	.....	99	99	685	1,060
Other countries	13	25	191	635	1,505
Total	2,733	1,960	8,476	9,348	4,13
PARAFFIN WAX:					
United States	628	950	1,130	1,144	654
Poland	115	227	547	941	661
Germany	.....	74	74	420	64
Italy	.....	.....	.....	.....	177
Total	743	1,251	1,751	2,505	1,556



Photograph of F. G. Clapp taken at the Aillatu oil seepage in the Mazar province of Afghanistan, showing the geologist with his military guard. Such a guard is a necessary precaution against bandits. The Afghan pony to the right is, we understand, closely related to the blooded Arabian steeds which are so highly regarded by lovers of horseflesh. In the picture below is illustrated the famous Mazar-i-Sharif mosque, one of the many which Mr. Clapp has visited.

Foreign Oil Legion

E. E. Soubry, adviser on petroleum marketing to the International Association (Petroleum Industry) Ltd., of London, the overseas marketing organization of the Standard Oil Company (New Jersey) group, is spending several weeks in the United States. Mr. Soubry reports that while political conditions in Europe are unsettled the tension appears to be less than it was a year ago. Indications are that the demand for petroleum products will continue to increase during 1938 as it has done steadily for the past several years. Mr. and Mrs. Soubry expect to return to England in time to spend the Christmas holidays at home.

E. E. Soubry

Frederick G. Clapp, executive of Amiranian Oil Company and Inland Exploration Company, is now in Afghanistan. He arrived in Iran September 17th, where he consulted with the various field parties, and proceeded to Afghanistan October 20th, where he will be remaining for several months. It is not his first visit to these countries, for it was Mr. Clapp who carried out the early geological work there and surveyed the areas several years ago. On these occasions he has had many opportunities to indulge in his enthusiasm for archaeology—visiting the burial mounds, tombs, and ruins of ancient cities, as well as studying the numerous beautiful mosques.

Frederic Ewing, director of Socony-Vacuum Oil Company, and vice president in charge of eastern operations, announced today his withdrawal from active service in the Company for reasons of health. Walter Faust, previously in charge of the marine and aviation business for Socony-Vacuum, has been appointed to the position of eastern sales manager for New England, New York, New Jersey, and Pennsylvania, as of January 1, 1938.

Juan March, well known Spanish financier, is reported by the French press to be on a trip to Italy for the purpose of establishing a joint Spanish-Italian company to exploit oil-bearing shales in the areas held by the nationalist forces. This company also intends to produce synthetic petroleum products.

Professor V. N. Ipatieff

Prof. Vladimir N. Ipatieff, director of chemical research, Universal Oil Products, celebrated his 70th birthday and 45 years of scientific work on November 21st. Born in Russia, Prof. Ipatieff is now a U. S. citizen. During the world war he was in charge of all chemical activities of the Russian government, with the rank of Lieutenant General. Introduced as a young officer to Tzar Alexander III, having frequent meetings with Tzar Nicholas II during the war, being called back to work

by Lenin and conferring with Trotzky during the years of revolution, he looks back on a life of seven decades practically unique. His discoveries are the basis of many industrial processes, particularly in petroleum refining and synthesis of hydrocarbons. His work has been internationally recognized and he has been the recipient of many honors from various governments and learned societies.

HENRY L. DOHERTY, president of Cities Service Company, has been awarded the Anthony F. Lucas gold medal for distinguished achievement in improving the practice of finding and producing petroleum. His contribution to petroleum production was recognition of the importance of gas dissolved in oil in the pool, its relation to viscosity of the fluid and its flow to the wells. From these discoveries stemmed unit operation of pools, now required by law in the United States for development of oil in federal lands. The medal has been awarded on only one previous occasion.

M. A. RHYS PRYCE and ED. TRAFFORD, both of Trinidad Leaseholds Ltd., have been travelling through the United States with stop-overs at New York and Houston. R. BEAUMONT, managing director, accompanied them on the early stages of their visit and returned to London on board the NORMANDIE November 24th. Mr. Rhys Pryce left Miami for Pointe-a-Pietre early in December. Mr. Trafford, who is the company's drilling superintendent, is continuing his study of American field practice at Shreveport and various Illinois fields before following to Trinidad about Christmas.

WALTER P. WILSON—formerly field assistant to Dr. Frank Reeves for the U.S. Geological Survey and more recently carrying out surveying work for Oil Search Ltd. in Australia, British New Guinea and Papua under Dale Condit—left the United States November 10th on board the HAMBURG on his way to Iran. Mr. Wilson is engaged in geological work for Amiranian Oil Company, and his address will be 10, Khiaban Nosrat, Teheran, Iran.

THROUGH an incorrectly-marked photograph received, the picture published on page 55 of our October issue was identified as that of DR. WILHELM KRAUSS of Olex Deutsche Benzin-und Petroleum G.m.b.H. The picture was actually one of M. H. ENGEL, managing director of Deutsche Vacuum Oel A.G., Hamburg.

KENNETH R. KINGSBURY

©Greystone Studios

KENNETH RALEIGH KINGSBURY, who died suddenly of a heart attack Nov. 22nd, en route through the Panama Canal while on a pleasure cruise to Havana, has been for many years one of the prominent oil men of the United States. As president of Standard Oil Company of California he had been instrumental not only in retaining its place as the largest company operating on the Pacific Coast but had carried its expansion into foreign fields, making it one of the notable international organizations in the industry.

Born at Columbus, Ohio, Jan. 22nd, 1876, Mr. Kingsbury received his university training at Princeton, graduating in 1896. He spent the following year taking a course in mining engineering at Columbia University and in December, 1897, obtained a job with the Standard Oil Company at $60 a month. His first work was counting lengths of pipe in connection with the building of the Southern Pipe Line Company's line in Pennsylvania. Later he became fireman at a pumping station on the line, a time keeper and a gauger. Following this field experience he obtained a transfer to the accounting department at 26 Broadway and from that position moved to the specialty sales department.

In 1906 Mr. Kingsbury became assistant to H. M. Tilford, and later to James A. Moffet who became president of Standard Oil Company of California in 1909, and from that time began his acquaintance with the oil industry on the Pacific Coast. Through the elder Moffett he became vice-president of the California company in 1911 and served in that capacity until 1919 when he was elected president.

Although his experience had made him familiar with all branches of the oil business "K.R.", as he was widely known to his acquaintances, was essentially a salesman. He pioneered the system of company service stations while he did much to popularize aviation and in many other ways gave impetus to the broader use of petroleum products. Under his direction Standard of California followed a liberal and progressive labor policy, introduced a plan of stock ownership by employes and provided accident compensation, life insurance and pensions for its workers.

In recent years Mr. Kingsbury had devoted much of his attention to expanding the international operations of his company, acquiring control of the prolific Bahrein and Saudi Arabia fields, concessions in Sumatra and New Guinea, and extending its operations in both South and North America. In 1936 an important deal was made with The Texas Corporation, by which the two companies combined their interests and operations in the Near and Far East through joint ownership of the California Texas Oil Company. Through these developments Standard of California, within the space of a few years, has emerged from the position of a sectional organization, serving a limited though important part of the United States, to a factor of noteworthy importance in the world situation.

Although he was a hard worker and deeply immersed in his business, Mr. Kingsbury found time for many civic activities in San Francisco. He was chairman of the board of trustees that built the city's war memorial and as chairman of the finance committee of the Golden Gate Exposition, which is to be held in 1939, was instrumental in raising the funds to finance that enterprise. At the time of his death and for several years preceding he was vice-president at large of the American Petroleum Institute and he had taken a leading part in the movement for oil conservation and stabilization.

In 1917 Mr. Kingsbury married Mary Bell Gwin Follis who survives him.

Probably no man in the oil industry had a wider circle of acquaintances or a greater host of friends than Mr. Kingsbury. His attractive personality and keen interest in all sorts of human activities drew men to him. He was an ardent sportsman, especially fond of fishing, hunting and golf, kept in close touch with public affairs and was a delightful travel companion. Though a strict disciplinarian he was loved and admired by the men who worked with him. His passing will be mourned in all ranks of the petroleum industry.

WORLD OIL PRODUCTION—Official Figures

All figures furnished direct to WORLD PETROLEUM by governments, except where otherwise specified—Table revised monthly

(Figures in U.S. barrels of 42 gal.—Conversion ratios used where statistics are received in tons are weighted averages for individual countries)

Country	November 1936	December 1936	January 1937	February 1937	March 1937	April 1937	May 1937	June 1937	July 1937	August 1937	September 1937	Preliminary Figures October 1937
United States	91,018,000	97,652,000	98,567,000	93,173,000	106,724,000	104,979,000	110,911,800	105,812,000	110,721,000	115,090,000	109,980,000	108,000,000
Russia[2]	16,683,894	17,413,623	16,117,461	13,796,325	15,907,051	16,401,771	18,130,230	17,953,812	18,580,752	15,830,000[1]	16,663,000[1]	17,600,000
Venezuela	13,831,410	8,171,274	9,559,158	13,130,903	15,066,287	14,686,657	14,498,968	16,260,492	16,469,071	17,861,784	17,640,872	17,979,227
Roumania	4,982,000	5,050,000	4,768,000	4,217,000	4,595,000	4,412,000	4,494,000	4,151,000	4,317,000	4,293,000	4,256,000	4,313,000
Iran[3]	4,985,640	5,355,786	5,665,500	4,766,574	6,330,252	6,224,496	6,247,158	6,639,966	7,093,206	7,191,408	7,078,098	7,100,000
Netherland India	4,379,480	4,433,034	4,267,148	4,011,266	4,405,436	4,348,185	4,553,298	4,464,725	5,208,460	4,888,298	4,586,630	4,766,689
Mexico	3,204,007	4,259,733	4,233,635	3,922,929	4,307,952	4,249,838	3,387,950	3,338,311	3,848,587	2,800,868	3,432,101	4,373,000
Iraq[4]	2,359,875	2,161,140	2,638,745	2,386,687	2,709,260	2,665,259	2,747,102	2,344,213	2,429,587	2,429,787	2,513,145	2,663,344
Colombia	1,537,683	1,641,636	1,668,490	1,617,441	1,622,226	1,660,469	1,678,580	1,724,173	1,681,799	1,592,592	1,617,433	1,811,759
Peru[5]	1,459,534	1,506,716	1,462,871	1,335,130	1,479,964	1,426,891	1,451,220	1,427,939	1,484,382	1,835,800	1,484,761	1,500,000
Argentina	1,356,396	1,356,396	1,355,029	1,237,459	1,317,000[1]	1,267,000[1]	1,270,000[1]	1,278,000[1]	1,280,000[1]	1,296,000[1]	1,270,000[1]	1,268,000
Trinidad	1,154,093	1,231,365	1,263,456	1,157,408	1,287,097	1,301,260	1,351,198	928,752	1,377,547	1,433,474	1,358,600	1,393,317
Burma	612,230	644,322	583,428	601,638	635,792	625,937	690,501	638,874	675,000[1]	650,000[1]	640,000[1]	660,000
Bahrein[6]	419,643	619,910	730,064	549,260	799,994	659,557	432,748	684,348	694,000[1]	703,000[1]	700,000[1]	701,000
Poland	318,360	325,940	300,886	295,620	316,844	318,360	318,360	310,780	318,360	299,460	310,780	312,000
Brunei[7]	320,902	351,025	386,181	356,897	389,612	363,226	376,191	349,500	353,313	373,760	341,111	351,711
Germany	253,558	277,269	263,369	231,466	243,012	247,060	245,088	249,434	267,847	279,727	282,155	288,936
Japan[8]	202,385	212,326	219,410	194,037	207,423	198,898	206,544	200,092	204,710	214,819	205,914	208,000
Ecuador	163,870	175,918	180,058	160,675	180,727	181,352	189,658	182,711	186,175	184,780	178,122	182,053
British India	166,387	164,896	174,507	155,219	167,418	162,699	172,458	181,436	190,000[1]	201,000	210,000[1]	200,000
Sarawak[9]	133,913	139,708	136,658	124,609	136,887	130,481	134,523	131,625	143,445	138,031	134,311	133,684
Canada[10]	129,152	139,701	141,078	153,906	175,575	188,014	192,845	209,181	241,737	288,934	298,753	348,432
Egypt[11]	97,685	98,602	99,518	86,780	93,432	89,480	97,077	98,021	99,182	97,818	100,699	97,203
France	39,715	41,755	37,148	39,990	43,053	41,861	42,096	45,445	42,125	43,367	44,000[1]	41,000
Czechoslovakia	9,767	9,632	9,311	9,595	9,383	9,574	8,824	10,824	11,529	10,125	9,667	9,500
Other countries[1]	32,000	28,000	28,000	30,000	30,000	34,000	35,000	33,000	30,000	28,000	31,000	34,000
Total	149,851,579	153,461,707	154,856,099	147,741,814	169,180,777	166,873,325	173,864,417	169,648,654	177,984,814	180,055,832	175,367,152	176,329,765

[1]Estimate. [2]Russian Sakhalin included with Russia. [3]Anglo-Iranian Oil Company Ltd. figures revised; fuel oil returned to ground has been deducted. [4]Iraq Petroleum Company Ltd. export figures. [5]International Petroleum Company and Lobitos Oilfields Ltd. figures combined. [6]Bahrein Petroleum Company Ltd. figures. [7]British Malayan Petroleum Company Ltd. figures. [8]Japanese Sakhalin, Taiwan (Formosa) and Hokkaido included with Japan. [9]Sarawak Oilfields Ltd. figures. [10]Includes natural gasoline production. [11]Anglo-Egyptian Oilfields Ltd. figures.

ALL crude oil production figures published on this page for the 1932 to 1937 period have now been checked and revised by the official sources.

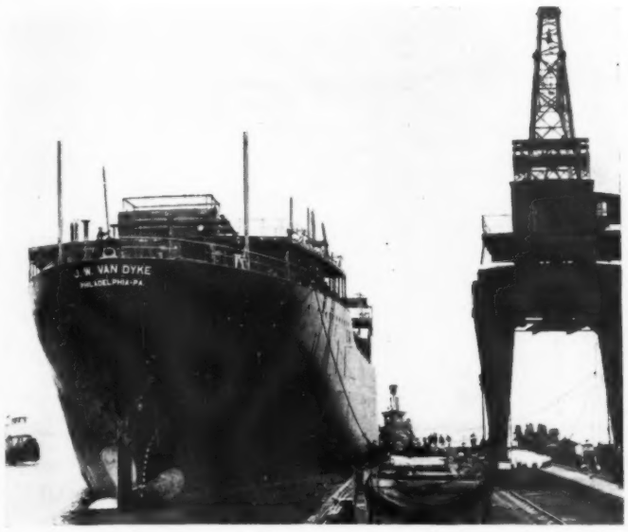
In the past, attention has been drawn to the confusion caused by statistics which have been converted by means of a general factor, (such as seven barrels as the equivalent of one ton of oil) without regard to specific gravity. This has been fully realized and deprecated by WORLD PETROLEUM—commencing with the November issue, all statistics on this page which are not received in barrels have been retrogressively converted with factors based on weighted average specific gravity for each country.

Official Crude Oil Production Figures for 1932 to 1937

	Daily Average to Oct. 31 1937	Daily Average 1936	Total to Oct. 31 1937	Total 1936	Total 1935	Total 1934	Total 1933	Total 1932
United States	3,499,861	3,001,410	1,063,957,800	1,098,516,000	996,596,000	908,065,000	905,656,000	785,159,000
Russia	546,646	545,453	166,980,402	199,635,921	184,008,033	175,635,783	155,596,429	155,927,997
Venezuela	503,794	424,237	153,153,419	155,270,840	148,809,057	136,098,681	117,113,940	115,615,788
Roumania	144,132	173,587	43,816,000	63,532,846	61,270,072	61,849,306	53,919,708	53,651,978
Iran	210,346	169,176	63,945,250	61,928,591	56,560,863	56,937,308	53,532,977	48,691,634
Netherlands India	149,671	131,043	45,500,135	47,961,744	45,307,913	45,107,828	41,234,498	37,988,913
Mexico	124,326	112,098	37,895,171	41,027,915	40,240,563	38,171,946	34,000,830	33,805,496
Iraq	83,927	81,730	25,513,884	29,913,150	27,410,983	7,639,849	1,094,915	871,840
Colombia	54,852	51,246	16,674,962	18,756,110	17,597,655	17,337,900	13,156,126	16,415,814
Peru	48,977	48,068	14,888,958	17,593,069	17,056,555	16,314,381	13,257,318	9,899,285
Argentina	42,232	42,235	12,838,488	15,457,960	14,297,025	14,021,901	13,690,556	13,138,747
Trinidad	42,277	36,167	12,852,109	13,237,030	11,671,224	10,894,363	9,561,353	10,186,151
Burma	25,124	20,731	7,657,722	7,587,718	7,181,113	7,278,859	7,114,311	7,073,437
Bahrein	21,888	12,690	6,653,971	4,644,635	1,264,807	285,072	31,377	902
Poland	10,198	10,572	3,100,240	3,869,575	3,901,881	4,011,336	4,174,079	4,219,634
Brunei	12,498	9,009	3,799,280	3,269,938	3,302,905	2,705,350	2,035,656	1,220,086
Germany	8,546	8,389	2,598,084	3,076,858	2,967,438	2,204,402	1,656,602	1,594,807
Japan	6,775	6,568	2,059,847	2,403,072	2,294,878	1,872,837	1,504,412	1,683,439
Ecuador	5,942	5,308	1,806,311	1,942,467	1,731,785	1,636,619	1,619,902	1,597,641
Sarawak	4,422	4,507	1,344,254	1,547,882	1,776,593	1,942,591	2,206,815	2,399,733
British India	7,059	5,405	2,146,020	1,978,329	2,037,810	1,921,863	1,628,803	1,743,878
Canada	7,344	4,110	2,232,475	1,504,287	1,447,204	1,410,895	1,145,333	1,044,413
Egypt	3,155	3,392	959,210	1,241,550	1,234,170	1,501,624	1,625,895	1,854,057
France	1,382	1,562	420,085	534,063	529,664	700,000	786,366	755,146
Czechoslovakia	323	346	98,332	126,603	136,580	177,797	121,695	126,603
Other Countries	1,033	969	314,000	355,600	398,800	430,200	391,500	370,700
Total	5,566,730	4,910,008	1,693,206,409	1,796,913,753	1,651,031,571	1,515,153,691	1,437,857,396	1,305,886,402

INTERNATIONAL NEWS

And Reports



Atlantic Refining Company's J. W. Van Dyke, launched Nov. 20th, is the world's largest welded ship and the first American-built turbo-electric tanker. Her deadweight capacity is 18,500 tons; her loaded displacement 23,989 tons. The 5,000 h.p. engines will give her a speed of 13.25 knots, enabling her to make the trip between Philadelphia and Gulf ports in six days. Her high-speed pumps have a daily capacity of 15,000 bbl. per hr., approximately three times the usual discharge rate.

WORLD'S DEEPEST PRODUCER —NEW FIELD AT RIO BRAVO

UNION Oil Company's K.C.L. 1-34 was brought in November 4th, twenty miles north of Bakersfield, for a daily potential of 5-6,000 bbl. from a depth of 11,302 ft. This sets a new record as world's deepest producing well and establishes apparently prolific reserves in hitherto unproductive territory. It was spudded in last March and completed after 200 days of drilling. The well has never been fully opened up; at time of writing it is beaned down to 40/64-in. and is producing 1,666 bbl. of 39.6 deg. A.P.I. oil daily with a 2,175 lb. tubing pressure and 2,149 lb. on the casing. In addition to oil, the well produces approximately 1,307,000 cu. ft. of gas.

MORE TANKERS FOR ROYAL DUTCH-SHELL

ROYAL Dutch-Shell interests have concluded negotiations with six British shipyards for eight tankers, previously having placed contracts for eight similar vessels aggregating 98,000 tons d.w. with concerns in the Netherlands. Total value of the orders is about $20,000,000.

MOROCCAN OIL EXPORTED

FIRST cargo of petroleum shipped from Morocco arrived at Havre, France, early in November aboard the tanker ALGOL. The shipment consisted of 1,000 tons and is being stored near Port-Layantey for the Soc. Cherifienne de Petroles.

BRITISH OIL IMPORTS

INCREASED arrivals of crude oil from most of the principal exporting countries were a feature of British import trade in October. The total for the month was 1,379,000 bbl., compared with only 771,000 bbl. in October, 1936. As a result of this increase, total imports of crude for the ten months to October 31st show a small advance on the corresponding period of last year. Netherlands West Indies remains the principal supplier of crude, with a total of 3,251,000 bbl. for the January-October period. October arrivals of gasoline were less than in 1936, largely as a result of smaller shipments from the United States. Gasoline imports for the ten months, however, still show a large expansion against 1936. A big increase occurred in gas oil imports in October and this product also shows a large increase for the year to date. Total imports of all petroleum products for the ten months to October 31st, at 73,918,000 bbl. advanced by 4.2 percent from the 1936 figure.

British Oil Imports by Products

(Barrels)

	October 1937	Ten months to Oct. 31 1937	Ten months to Oct. 31 1936
Gasoline	2,611,000	32,417,000	30,595,000
Kerosene	583,000	5,236,000	5,183,000
Gas Oil	389,000	3,397,000	2,705,000
Lubricating Oil	262,000	2,822,000	2,832,000
Fuel Oil	1,869,000	16,915,000	16,667,000
Other Sorts	93,000	423,000	428,000
Refined Products	5,807,000	61,210,000	58,410,000
Crude Oil	1,379,000	12,708,000	12,558,000
Total Imports	7,186,000	73,918,000	70,968,000

GULF EXPORT PRICES FOR MAJOR OIL PRODUCTS

Products		Oct. 27	Nov. 2	Nov. 9	Nov. 16
		Cents Per Gallon			
GASOLINE:	U. S. Motor	5⅞	5¾	5¾	5½
	64/66-375 E.P.	6⅛	6	6	5⅞
	59 Octane and below	5⅞	5¾	5¾	5½
	63 Octane and above	6⅛	6⅛	6	5⅞
AVIATION GASOLINE:	Gulf Export in cargo lots	9½	9½	9¾	9¾
KEROSENE:	44 w.w.	5⅛	5⅛	5⅛	5⅛
	44/43 w.w.	5⅛	5⅛	5¼	5¼
	41/43 p.w.	5⅛	5⅛	5⅛	5⅛
GAS OIL:	26-30 translucent	4⅜	4⅜	4⅜	4⅜
	30 plus translucent	4½	4½	4½	4½
		Dollars Per Barrel			
FUEL OIL:	Bunker C	95	95	95	95
	Cargo lots	85	85	85	85
	Diesel oil	1.90	1.90	1.90	1.90
		Cents Per Gallon			
LUBRICATING OIL:	Bright Stock No. 8	23½	23½	23½	23½
	Bright Stock No. 6½	23	23	23	23
	600 Warren E	21½	21½	21½	21½
	600 Unfiltered s.r.	16½	16½	16½	15½
(New York Export Market)	650 Unfiltered s.r.	21	21	20	20
	600 Flash s.r.	21½	21½	21½	20½
	630 Flash s.r.	25½	25½	24½	23½
	Neutral 200 No. 3	30	30	30	30
	Neutral 150 No. 3½	25½	25½	25½	25½
(South Texas Export Market)	Red oil 500 No. 5-6	8¾	8¾	8¾	8¾
	750	9¼	9¼	9¼	9¼
	1200	9¾	9¾	9¾	9¾
	Pale oil 500	8¾	8¾	8¾	8¾
	750	9¼	9¼	9¼	9¼
	1200	9¾	9¾	9¾	9¾
		Dollars Per Barrel			
CRUDE OIL:	East Texas delivered at Gulf for export	1.51	1.51	1.51	1.51

Prices quoted in preceding issues for Venezuelan, Trinidad and Panuco crude oil are being discontinued as they represent only an occasional spot cargo sale and do not serve as a true indication of the market trend in these countries.

FREIGHT RATES

	Oct. 27 Dirty	Oct. 27 Clean	Nov. 2 Dirty	Nov. 2 Clean	Nov. 9 Dirty	Nov. 9 Clean	Nov. 16 Dirty	Nov. 16 Clean
	Shillings Per Ton							
Gulf—U.K. Continent	20/-	24/-	20/-	24/-	19/-	37/3	19/-	23/-
California—U.K. Continent	—	—	—	—	no bookings		—	—
Aruba—U.K. Continent	19/-	19/-	19/-	19/-	19/-	19/-	19/-	19/-
North Atlantic—U.K. Continent	18/-	20/6	17/-	20/6	17/-	20/6	17/-	20/6
	Cents Per Barrel							
California—North Atlantic	—	—	—	—	no bookings		—	—
Gulf—North Atlantic	28	26	26	26½	26	26½	26	26½
Venezuela—North Atlantic	30	—	30	—	30	—	30	—
Tampico—North Atlantic	30	—	30	—	30	—	30	—

WORLD PETROLEUM ABSTRACTS

Summaries of the Most Important Articles as Published in the Oil Press of the World Dealing With Technical and Economic Aspects of the Petroleum Industry. Edited by Dr. O. W. Willcox

GEOPHYSICS

GRAVITATIONAL SURVEYING WITH THE GRAVITY-METER—L. M. Matt-Smith, in GEOPHYSICS, vol. 2 (1937), No. 1, pp. 21-32.

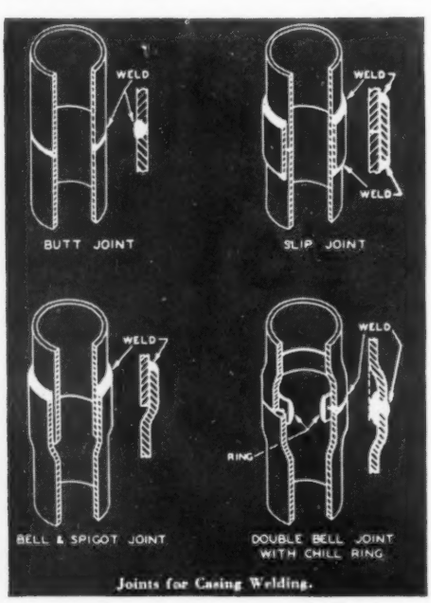
This paper discusses briefly the history of gravity meters and the importance of gravity surveys for the prospector. The gravity-meter, an instrument which measures gravity differences directly, has now been developed to the point where it is superior to the torsion-balance in several important particulars for the purpose of making gravitational surveys. It is able to survey a given area with sufficient detail for most petroleum surveys in about one-third the time if we consider crews of comparable size and cost. Accuracy will be better by a factor of two or more, the advantage becoming greater as the size of the survey is increased. The gravity-meter is much less affected by local terrain irregularities. This makes it possible to operate on the roads instead of having to find a suitable spot, as is the case with the torsion-balance. It also enables the gravity-meter to do more reliable work in most areas and much better work in poor areas.

DRILLING

CIRCUMFERENTIAL FIELD WELDING OF CASING—L. R. Hodell, before A.P.I., Chicago, November, 1937.

The principal factors necessary for the successful welding of casing in oil wells are: 1, a readily-weldable steel; 2, trained personnel; 3, necessary auxiliary equipment.

By readily-weldable steels is meant primarily steels of low carbon content. Ordinary A.P.I. grades "C" and "D" steels ar not considered readily-weldable. A carbon content of 0.35 percent is considered the absolute top limit for steels for casing that is to be welded.



Joints for Casing Welding.

Personnel trained in the welding of casing is practically non-existent. However, welders who are competent in other techniques may be instructed in the welding of casing, and after a few days' practice will be proficient.

Necessary equipment for the handling of casing that is being welded consists of pick-up and line-up clamps and other line-up devices, slip elevators, spiders with automatic slips, and goggles for the drilling crew, which will protect them from the injurious rays of the arc.

The joint efficiencies obtained in the welding of casing have been studied by means of making full-joint pullout tests. The results indicate that slip- or sleeve-type joints give relatively low efficiencies. The bell-and-spigot, the straight-butt, and the double-bell and chillring joints yield efficiencies of 80 to 100 percent readily, and by discreet choice of joint and technique may yield efficiencies from 90 to 100 percent.

Time analyses as to the running of pipe by means of welding indicate that the bell-and-spigot pipe may be run more rapidly than the butt joint. Tables are given for the rates of welding of various types of joints with a varying number of welders.

Cost studies indicate that, owing to the fact that casing for welding may be bought for from 10 to 15 percent less than threaded and coupled casing, when the cost of welding is considered a respectable profit will be left to the operator.

The net result of welding casing is to make for cheaper pipe strings, with greater joint efficiencies, which probably means a greater ultimate recovery of pipe; and probably most important to the producers nowadays, who are going to great depths and encountering high formation pressures, we should be able to have pipe strings which will not leak. It seems not unreasonable to believe that this combination of benefits to be had from the welding of casing will in the near future make for its very wide practice.

SEISMIC DISTURBANCES INDUCED BY DEEP ROTARY DRILLING—Harry F. Wright, in OIL & GAS JOUR., vol. 36 (1937), No. 20, pp. 42-45.

Drilling of oil wells on developed town lot areas, such as in the northern Oklahoma City area, has resulted in claims against the operators for damages caused by vibrations from the drilling rigs to residences and other buildings.

With a view to determining the magnitudes of these vibrations and their effective radius of influence the author made a series of tests with a geophone such as is in common use in seismographic observations, with an arrangement that would register the violence of earth shocks by means of a voltmeter.

The first step was to ascertain the range of vibrations in locations remote from drilling wells, due to the normal circumstances of a thickly populated community. These were found to range from a magnitude of 0.5 to 1.0 at stations unaffected by local traffic (as in a park) up to 13.0 at the street curb when a trolley car or heavy trucks were passing. When the geophone was moved to the vicinity of active drilling operations the amplitude of the vibrations did not exceed the normal range until within 400 ft. of the well, and did not show any pronounced increase until the well was approached within 200 ft. The vibration rapidly increased in intensity at distances shorter than 100 ft. In the case of an electric rotary outfit they were 20 at about 75 ft. and in the case of a steam rotary rig about 10 at 50 ft. In this latter case the vibrations of the boilers pulsating under a heavy load were much more perceptible at 200 ft. than those arising from the underground operations at the same distance.

While these measurements are largely approximative, they do show that the most severe shocks occasioned by deep rotary drilling are little if any more severe than vibrations caused by trucks and trolleys passing along a city street.

CHEMISTRY

STUDY OF CATALYSTS FOR THE EQUILIBRIUM, ETHYLENE-WATER-ETHANOL—by A. J. Paik, Sherlock Swann, Jr., and D. B. Keyes, before PETROLEUM DIVISION AM. CHEM. SOC., Rochester, 1937.

Aerogels tried gave negative results as catalysts at low temperatures. The best catalyst studied was 5 percent silver sulfate in sulfuric acid on pumice. The silver sulfate catalyzed the following reaction—$C_2H_5HSO_4 = C_2H_4 + H_2SO_4$. It was inactive for the following reaction: $C_2H_5HSO_4 + H_2O = C_2H_5OH + H_2SO_4$.

DIRECT SYNTHESIS OF ESTERS FROM OLEFINES AND ORGANIC ACIDS—by T. W. Evans, K. R. Edlund, and M. D. Taylor, before PETROLEUM DIVISION AM. CHEM. SOC., Rochester, 1937.

Direct combination of olefines and organic acids in the presence of a catalyst to form esters is discussed. The preparation of secondary butyl and amyl acetates by a liquid phase process, the nature of commercially available olefines and the conditions necessary to secure good ester recovery are treated in detail. It has been found, when using sulphuric acid as the catalyst, that operating in a region of two liquid phases gives the best results. Thus the upper hydrocarbon phase only is worked up for its ester content and the lower phase is recycled as catalyst with fresh olefine and organic acid.

NITRATION OF PARAFFINIC AND POLYMETHYLENIC HYDROCARBONS—Thaddee Urbanski and Marian Son, before SECOND WORLD PETROLEUM CONGRESS, Paris, June, 1937.

The authors have found a new method of nitration of saturated hydrocarbons: normal paraffinic and polymethylenic (such as cyclohexane) which consists in the action of nitrogen monoxide on the hydrocarbon vapors at a temperature above 100 deg. The majority of the hydrocarbons give the best yield in the neighborhood of 200 deg.

The reaction is carried out entirely in the gaseous phase, the products of the reaction condensing into a cooled receiver.

The authors have succeeded in nitrating hydrocarbons such as propane, methane as well as hydrocarbons of longer normal chain: of C_5 to C_9.

By this method has been obtained: nitromethane and a certain quantity of polynitromethanes: some

propane, pentane, hexane, heptane, octane, nomane —and the mononitro—and dinitro-derivatives.

Cyclohexane yields nitrocyclohexane.

The yield (except in the case of methane) can amount to 60-75 percent of the theoretical value which depends not only on the nature of the hydrocarbon and on the temperature of nitration but also on the length of the nitrater.

In the case of methane a much lower yield is obtained.

Nitration of N-Pentane—by H. B. Hass and J. A. Patterson before PETROLEUM DIVISION AM. CHEM. SOC., Rochester, 1937.

Vapor-phase technique for the nitration of saturated hydrocarbons has been extended to normal pentane. Nitro-paraffins thus formed are 1-nitropentane, 2-nitropentane, 3-nitropentane, 1-nitrobutane, 1-nitropropane, nitroethane and nitromethane. These include all of the compounds theoretically derivable by adding a nitro group to the free radicals obtainable from pentane by loss of a hydrogen atom or by fission of a carbon-to-carbon linkage.

Thermal Decomposition of N-Octane, by R. F. Marschner, before PETROLEUM DIVISION AM. CHEM. SOC., Rochester, 1937.

Because of the dearth of complete and accurate thermal decomposition data upon the n-paraffins between n-hexane and hexa-decane, the behavior of n-octane in the neighborhood of 570 deg. C. and at atmospheric pressure was studied. The n-octane used was isolated from petroleum in quantities large enough to permit determination of the amounts of essentially all pyrolysis products. At 570 deg. C. moderate changes in the extent of decomposition had no effect upon the product, while dropping the temperature to 538 deg. had little effect. At 570 deg., exactly the same products were obtained in pyrex as in stainless steel, provided the metal apparatus was thoroughly burned out between runs. When the conditioned surface of the stainless steel coil was not so destroyed, the products resulting below 570 deg. differed only in the much larger amount of methane produced. Above 570 deg., the catalytic decomposition to the elements became important.

The products, compared to those predicted by the free-radical theory, are deficient in ethylene and their distribution in the higher boiling range is not independent of the number of carbon atoms. The former difference cannot be readily explained but the latter is apparently the result of unequal splitting of cetyl radicals. No evidence of isomerization of the alkenes produced was obtained, but besides l-alkenes, other n-alkenes and cycloalkenes were present in the liquid olefins.

Activity of Oxygen Towards Hydrocarbons of High Molecular Weight—H. I. Waterman, J. J. Leendertse and E. C. H. Palm, in J. INST. PET. TECHNOLOGISTS, vol. 23 (1937), No. 166, pp. 483-490.

The authors subjected 80 mixtures of hydrocarbons, mostly gas oils or lubricating oils, to the Sligh oxidation test; many of these oils were completely saturated, in most cases by a careful non-destructive catalytic hydrogenation. Natural oils and polymer fractions were included together with a few unsaturated oils.

For all the saturated oils the quantity of sludge formed in the Sligh test was very low, but it is emphasized that the Sligh test evaluates only one of the products of the action of oxygen on oils, namely, the sludge or sediment insoluble in the oil. It is now proven that, in many cases in which the sludge value has been found to be very low, oxygen has been absorbed for the production of oxygen-containing compounds which were soluble in the oil—as indicated by the acid and saponification numbers after oxidation. The results distinctly show the danger of using an indirect method, such as the Sligh test, for judging the total oxygen stability of oils.

Alkylation of Paraffins with Olefins and the Identification of the Paraffins Formed—by Aristid V. Grosse and Vladimir N. Ipatieff, before PETROLEUM DIVISION AM. CHEM. SOC., Rochester, 1937.

The identification of hexanes formed by alkylation of i-butane with ethylene in the presence of boron fluoride or aluminum chloride, was achieved by two parallel but independent methods—namely, preparation of chemical derivatives and comparison of Raman spectra.

Of the five possible hexanes 2, 3-di-methyl-butane and 2-methyl-pentane were always present, the former in quantities from 90-70 percent, the latter from about 10-25 percent of the total mixture. The other hexanes could not be definitely identified and could be present only in traces, if at all.

Besides comparing the Raman spectra of the five pure hexanes with our fractions (carried out jointly with Dr. Rosenbaum, University of Chicago) the identifications were made definite by preparing the 2, 3-di-bromo-derivative of the butane and the 2, 3, 4-tri-nitro-derivative of the pentane.

Reaction of Sulphur Dioxide with Olefins—by R. D. Snow and F. E. Frey, before PETROLEUM DIVISION AM. CHEM. SOC., Rochester, 1937.

Many olefins react with sulphur dioxide yielding resinous heteropolymeric products which give coherent moldings comparable in mechanical and electrical properties to some commercial plastics. The reaction exhibits unusual chemical behavior.

Light of less than 3,800 A.U. or a catalyst, is necessary to effect the reaction. Several new catalysts which have long life and are effective in very low concentrations are described. These include mild oxidizing agents such as nitrates. Certain olefins, such as isobutene, which will itself react with sulphur dioxide at a suitably low temperature, will inhibit the reaction of normal butenes with sulphur dioxide at room temperature. The reaction exhibits an unusual temperature effect. There exists a rather sharp temperature, apparently characteristic of the olefin, above which the reaction does not take place.

Petroleum as Source Material for Chemical Derivatives—by Gustav Egloff and J. C. Morrell, before PETROLEUM DIVISION AM. CHEM. SOC., Rochester, 1937.

Petroleum and its selected fractions, including special groups of hydrocarbons and individual compounds such as the normally gaseous hydrocarbons, are readily available and are comparatively cheap raw materials for the production of a large number of chemical derivatives. These include products obtained by cracking, oxidation, halogenation, treatment with mineral acids, hydration, alkylation, isomerization, cyclization, polymerization, depolymerization, hydrogenation, dehydrogenation, hydropolymerization, and depolyalkylation. Some of the more important products are alcohols, glycols, alcohol-ethers, aldehydes, ketones, esters, halogen derivatives, amines, mercaptans, sulphides, resins, solvents, carbon black, and individual hydrocarbons such as isooctane, benzene, toluene, and acetylene.

Polymerization of Propylene by Dilute Phosphoric Acid—by L. A. Monroe and E. R. Gilliland, before PETROLEUM DIVISION AM. CHEM. SOC., Rochester, 1937.

Propylene is polymerized catalytically by dilute phosphoric acid at temperatures above 250 deg. C. and at pressures of 150 atmospheres or higher. The polymerization is stepwise, the first product being dimer, this in turn reacting with more propylene to form trimer, and this latter compound then combining with more propylene to form tetramer, etc. Somewhat above 300 deg. C. and also at concentrations of H_3PO_4 over about 30 percent, the character of the polymer starts to change, an excess of heavier compounds forming at the expense of the yield of dimer. Below these limits the composition of the products depends solely on the extent of the polymerization of the feed, and varies from practically pure dimer initially to about 35 percent dimer at nearly complete reaction. In this range, the rate of dimer formation from propylene is closely proportional to the square of the reactant concentration in the gas phase above the acid catalyst, as well as to the volume and concentration of the latter.

Determination of Butenes in Refinery Gases—by Wallace A. McMillan, before PETROLEUM DIVISION AM. CHEM. SOC., Rochester, 1937.

A new method is presented for the determination of individual components normally occurring in gases from petroleum cracking operations. By its use, the individual butenes and butanes, with the exception of the individual isomeric 2-butenes, can be determined with an accuracy of $\pm$ 0.15 percent or better. No larger gas samples are required than are now used for low temperature fractional distillation, and the time required is but very little more than for this step alone.

A new reaction method for the determination of isobutene also has been developed which allows its determination with an accuracy of $\pm$ 0.1 percent in the presence of other normally gaseous olefins.

Separation of the Three Methyloctanes from Mid-Continent Petroleum—by Joseph D. White and Augustus R. Glasgow, Jr., before PETROLEUM DIVISION AM. CHEM. SOC., Rochester, 1937.

The complex methyloctane fraction of an Oklahoma petroleum has been successfully separated into its constituent hydrocarbons. The isolation of three of its seven components, 2-, 3-, and 4- methyloctane, by alternating distillation with extraction and crystallization is described. The three, in the order named, are present in petroleum in the proportion of 3, 1, and 1; the total methyloctane content of the crude oil being about 0.3 percent.

Boiling point, freezing point, density, refractive index, and critical solution temperature in aniline have been determined for each compound.

Olefins and Conjugated Dienes from Gas Oil—by Hans Tropsch, Charles L. Thomas, Gustav Egloff, and J. C. Morrell, before PETROLEUM DIVISION AM. CHEM. SOC., Rochester 1937.

A Pennsylvania gas oil has been pyrolyzed at temperatures of 800 deg. to 1,000 deg. and pressures of 50 to 500 mm. Varying the temperature or pressure in the range studied does not seem to influence the butadiene yield provided the oil gasified is kept constant at about 70 percent.

Packed tubes are superior to empty tubes and there is a difference in the various packings, the best so far being Coors Chemical Porcelain.

At 950 deg. C. and 175 mm. average pressure, the weight percent yields (based on the gas oil

reacted) of the products interesting for chemical synthesis are: C_2H_4 28.2 percent, C_3H_6 19.7 percent, C_4H_6 6.6 percent, C_4H_8 8.3 percent, $C_5H_8 + C_5H_6$ 3.1 percent and higher conjugated dienes 7.2 percent. In addition to these, 10.8 percent of a yield of high antiknock (90 A.S.T.M. Motor Method) gasoline was produced. Under these conditions 12 percent of the gas oil charged did not react.

Amount of coke produced in the reaction is surprisingly small. This is best indicated by the fact that the resistance to passage of the vapors increased from 50 mm. to only 55 mm. in a packed tube whose free volume was only 15 cc. This resistance increase was observed in a four hour run in which over 1,000 cc. of gas oil was treated.

Rate of Polymerization of Ethylene in the Gas and Liquid Phase—by F. R. Russell and H. C. Hottel, before PETROLEUM DIVISION AM. CHEM. SOC., Rochester, 1937.

A study was made of the rate of uncatalysed thermal polymerization of ethylene, both alone in the gas phase and completely dissolved in liquid naphthalene. In the range of initial concentration and temperature studied (0.35-0.80 moles/liter and 640-777 deg. F.) the rates of polymerization in the gas and in the liquid phase did not differ much in value. In the early stages of polymerization, the gas phase reaction was second order, the liquid phase between second and third. The rate was found to double every 26 deg. F. in the temperature range studied.

Hydrocarbons in Virgin Naphthas—by C. O. Tongberg, W. J. Sweeney, and M. R. Fenske, before PETROLEUM DIVISION AM. CHEM. SOC., Rochester, 1937.

Thirty-six standardized fractional distillations, each of about 170 liters (45 gal.), of various naphthas and gasolines have been made. A study of the results of these distillations, in which 20 were virgin naphthas, provided sufficient background for a rather detailed analysis of the constitution of these virgin naphthas. Certain of the naphthas exhibited marked similarities, while others were of widely different chemical composition. Interesting observations have been made on the three classes of hydrocarbons present, namely paraffins, naphthenes, and aromatics, as well as on the manner in which these classes are associated with each other in the naphthas.

Proximate Analysis of Gasoline—by Charles L. Thomas, Herman S. Bloch and James Hoekstra, before PETROLEUM DIVISION AM. CHEM. SOC., Rochester, 1937.

A procedure is given for determining the aromatic, olefinic, paraffinic and naphthenic constituents in gasoline.

Step 1. Fractionation of gasoline into cuts 10 to 40 deg., 40 to 70 deg., 70 to 100 deg., 100 to 125 deg., 125 to 150 deg., 150 to 175 deg., 175 to 195 deg. and bottoms (degrees Centigrade).

Step 2. Determination of olefin content in each fraction by titrating with bromide-bromate solution.

Step 3. Determining aromatics plus olefins by 25 percent SO_3 fuming sulphuric acid.

Step 4. Determining the paraffin-naphthene ratio in the unreacted portion from Step 3 by refractive index.

The method requires 11-12 cc. of sample in each fraction indicating a total sample of 85 cc. Since the fractions do not usually occur in equal amounts, a 300 cc. sample is preferred.

The method has proved entirely satisfactory for fractions boiling up to 150 deg. C. Above this there are inherent errors and these become appreciable on samples boiling above 195 deg. C. For this reason the method is not recommended for the higher boiling fractions of petroleum products.

PHYSICS

A Viscosity Index Independent of Temperature of Measurement—F. P. Malschaert, before SECOND WORLD PETROLEUM CONGRESS, Paris, June, 1937.

The incompatibility and inconvenience of the use of the Viskositäts-Polhöhe and Kinematic Viscosity Index are shown. It is proposed to alter the definition of the Viscosity Index: The Independant Viscosity Index I.V.I. $= 100 \times \frac{L - X}{L - H}$ where L, X and H are not viscosities, but their loglog (cst + 0.8), known as the W function, and to be found in the tables of Professor Uebbelohde. L and H are resp. 0 KVI and 100 KVI oils, and X is the unknown oil.

Diagrams are presented for the plotting of I.V.I. The advantage of the I.V.I. over the K.V.I. is claimed to be:

a) It is independent of the measurement-temperature, and is easily plotted on an ordinary millimeter grid

b) it may be extrapolated above 100 and under 0, without fear of singularities.

c) it varies in a logical way with the concentration of blends,

d) it allows a change of base oils (the 0 and 100 oils) without losing its main properties,

e) the I.V.I. figures between 0 and 100 oils are sufficiently close to those of the K.V.I., so as not to interfere with or entirely upset actual practice between these limits.

Fractionation of Heavy Petroleum Products by Gas Solutions at Ordinary Temperature—Godlewicz and S. Pilat, before SECOND WORLD PETROLEUM CONGRESS, Paris, June, 1937.

It has been established that a complete fractionation of petroleum or residues can be obtained at ordinary temperatures by the treatment of their solutions in the presence of light hydrocarbons by the introduction of gases under pressure, such as methane, natural gas, carbon dioxide and others. The principle of this method of fractionation consists in progressively varying the properties of the solvent by introduction of gas under pressure, which causes a separation of the heaviest hydrocarbons as a second liquid phase.

In view of the fact that the solubility of aromatics increases with increasing concentration in methane more rapidly than that of other constituents, this fractionation is different from the usual methods of distillation.

The principal advantage of this method is the elimination of heat action upon heavy petroleum products.

Extrusion, Penetration and Oil Content Relationships of Greases—Harry R. Shawk, in REFINER, vol. 16 (1937), No. 9, pp. 409-411.

In studying the consistency of greases the author undertook to make a comparison of the A.S.T.M. cone penetration values and the extrusion lengths of a number of greases. An apparatus was constructed consisting of a four inch cylinder, which was fitted with a piston operated from a direct-current motor through reduction gears. This gearing gave a 2160/1 speed reduction. The motor was controlled in speed by a potentiometer across the power supply line.

The grease extrusion cylinder was mounted vertically about eight feet from the floor. The wooden frame supporting the cylinder was equipped with a scale graduated to 0.5 cm. throughout approximately 250 cm. of length. By means of this scale it was possible to measure the length of extruded grease.

The test procedure consisted in filling the barrel with the grease sample. The motor was then started and the grease forced through the quarter inch sharp-edged orifice. After setting the potentiometer for a given velocity, it was found that the motor speed varied not over one percent throughout the period required to take six or more check readings.

As the grease was extruded through the orifice, the time was recorded as the lower end passed each five-centimeter graduation, and the velocity calculated at each point. This velocity was found to be practically constant; the variation being of the same magnitude as the motor speed variation.

The studies indicate that a definite relationship exists between the penetration values obtained by the use of the A.S.T.M. cone penetrometer, and the length of the extruded column required to produce fracture. This relationship is independent of the soap base of the grease, and of the mineral oil used in the manufacture of the grease. It is also shown that the penetration bears a linear relationship to the mineral oil content, regardless of the soap base or of the type of oil used in compounding. Finally, it has been shown that extrusion and mineral oil content may be represented by a straight line when plotted on semi-logarithmic scale.

From the curves it is possible to predict the penetration and extrusion for a grease of known oil content, which would be of value in making up greases to meet certain desired specifications. Conversely, from an examination of a grease with respect to its penetration or its extrusion values, it is possible to predict the percentage of mineral oil in the grease quite accurately. This coupled with the general appearance of the grease, which in general determines the soap base, will afford a rapid means of getting an approximate analysis of an unknown grease with respect to soap type and content.

Application of Raman Spectrography to the Study of Gasolines—A. Andant, before SECOND WORLD PETROLEUM CONGRESS, Paris, June, 1937.

In diffusion spectra for mixtures of liquid chemicals which do not react with one another the Raman rays given by each constituent—which incidentally are characteristics for every individual constituent—are not displaced in any way. Their relative intensities vary according to the proportions of the constituents in the mixture. This fundamental property has been applied to spectra for the identification of hydrocarbons in petroleum spirits. Fractional distillation of any spirit carefully carried out will permit of the separation of fractions having a narrow boiling range. By the Raman spectra of each of these fractions, the characteristic rays of various hydrocarbon formations were identified quite distinctly and it was possible to determine exactly their nature. This optical method of analysis has been applied to spirits of various origins and permitted identification of a number of individual constituents to a total of at least nineteen. Practical application of this method of analysis proposed by the author is only limited by the lack of knowledge of the Raman spectra of pure hydrocarbons.

Column Performance in the Rectification of Petroleum—by R. C. Gunness, before PETROLEUM DIVISION AM. CHEM. SOC., Rochester, 1937.

A commercial high pressure distillation column used for the stabilization of absorption naphtha was subjected to a series of extensive tests. The performance data, the reliability of which was confirmed by satisfactory heat and material balances, indicated that the column operated with a Murphree plate efficiency of approximately 100 percent. The varia-

tion in efficiency with vapor velocity or molecular weight of the diffusing component was within the limits of accuracy of the determinations (10 percent). The high plate efficiency of the column is attributed to the cross flow of liquid on the plates. The Murphree point efficiency was about 80 percent, based upon the assumption of but slight liquid mixing on the plates. The column was operated at a maximum vapor velocity of 0.23 ft. per sec. at 254 lb. per sq. in. without priming.

Viscosity of Liquids—W. R. van Wijk, before petroleum division am. chem. soc., Rochester, 1937.

Attention is drawn to the fact that it is possible to consider the viscosity of a liquid as mainly a function of the space available for the molecules. The available space corresponds to the specific volume in cases of a structureless liquid, but does not correspond to the specific volume in cases of a liquid possessing internal structure due to directional forces between the molecules. On this basis a qualitative understanding of the viscosity is obtained throughout the whole range, gas to liquid.

Effect of Pressure Upon Viscosity of Air, Methane and Two Natural Gases—B. H. Sage and W. N. Lewis, in am. inst. mining and metallurgical engineers technical publication no. 845 (1937).

In recent years there has been an increase of interest in the flow of gases at relatively high pressure. Hydrodynamic calculation of the energy losses in the flow of gases in conduits, as well as through the porous solid materials constituting natural petroleum reservoirs, requires a knowledge of the viscosity of the fluid at the pressure and temperature involved. Although there are numerous publications concerning the absolute viscosity of hydrocarbon gases at atmospheric pressure, there appears to be little information available relating to the effect of pressure upon the viscosity of these gases.

As a further contribution to the subject the authors made an investigation. The viscosities of the four gases were measured at temperatures from 74 deg. to 220 deg. F. and at pressures as high as 2,900 lb. per sq. in. The change in viscosity with pressure was found to be surprisingly large, amounting to as much as threefold for a pressure change of 3,000 lb. per sq. in. This indicates the importance of such information for use in calculations relating to the movement of natural gas in underground reservoirs or even to the turbulent flow of gas in high-pressure pipelines, such as the supply lines leading to the bottoms of high-pressure gas-lift or gas-injection wells. In hydrocarbon gases, the effect of pressure is greater for those of higher average molecular weight.

Heats of Formation of the Simple Organic Molecules—Frederick D. Rossini, before petroleum division am. chem., soc., Rochester, 1937.

The following subjects are discussed: the evaluation of heats of formation; the existing thermochemical data on the simple molecules (from 1 to 6 or 7 carbon atoms) of the various classes (paraffin hydrocarbons, olefin hydrocarbons, naphthene or cycloparaffin hydrocarbons, aromatic hydrocarbons, alcohols, ethers, ketones, aldehydes, acids, amines, cyanides or nitriles, sulphur compounds, and halogen compounds); bond energies and atomic heats of formation; and regularities in the heats of formation. It is concluded that new measurements are needed for all the above compounds, with the exception of the normal paraffin hydrocarbons, the olefin hydrocarbons, and the primary normal alkyl alcohols, accurate values for which are now available.

Freezing Points of a Number of Pure Hydrocarbons of the Gasoline Boiling Range and of Some of Their Binary Mixtures—by J. Smittenberg, H. Hoog and R. A. Henkes, before petroleum division am. chem. soc., Rochester, 1937.

Freezing point determinations were made of a number of carefully purified hydrocarbons with boiling points within the gasoline boiling range.

All the normal paraffin hydrocarbons examined crystallize easily and display no, or only slight, undercooling.

Several isoparaffins—chiefly those of strongly branched but symmetrical structure—also easily crystallize. Many other isoparaffins, on the other hand, show considerable undercooling. Some isoparaffins (particularly those which possess an asymmetrical carbon atom) could not be made to crystallize at all and solidified to a glass.

In the case of some other isoparaffins, which crystallized readily but with a small heat of crystallization, transition points were observed on further cooling.

After undercooling in a more or less pronounced degree, all then aphthenes and aromatics examined could be made to crystallize; transition points were observed with cyclopentane and cyclohexane.

Following up published data, the authors also studied a number of freezing point diagrams of binary hydrocarbon mixtures and found that as a rule there is an eutectic point, while the freezing point curves of the components conform to the formula for the ideal freezing point curve.

There is probably an interrupted series of mixed crystals in the n. octane—n. nonane system and a continuous series of mixed crystals in the 2-2-3-trimethyl butane—2-2-3-3-tetramethyl butane system. On cooling, most of the isoparaffin mixtures produce glass formation.

Boiling Points and Critical Properties of Hydrocarbon Mixtures—by R. L. Smith and K. M. Watson, before petroleum division am. chem. soc., Rochester, 1937.

By consideration of the principles of additivity of mixtures it has been concluded that for the application to mixtures of correlations of properties of pure components with specific gravity and boiling point, no one type of average boiling point is suitable for all properties. The following different average boiling points have been developed for application to correlations of the various physical properties:

Cubic Average Boiling Point
True Molal Average Boiling Point
Mean Average Boiling Point
Weight Average Boiling Point

Using these average boiling points new correlations of true and pseudo-critical temperature and pressure data are presented which are applicable both to pure components and wide boiling mixtures.

Testing the Behavior of Lubricating Oils at Low Temperatures—S. Erk, in oel und kohle, vol. 13 (1937), No. 34, pp. 853-855.

Behavior of a lubricating oil at the pour point is not completely evaluated by the usual cold test. The location of the pour point depends on the time of cooling, and the size of the crystals of paraffin that have separated depends on the rate of cooling. Starting resistance of a motor is governed by the resistance to flow of the lubricating oil after the crystal skeleton formed at low temperature has been broken up. This resistance is smaller than the force required to break up the skeleton. A satisfactory characterization of the cold resistance of a lubricating oil therefore requires, besides a determination of the pour point, a measurement of the resistance to flow of the oil at the temperature at which the oil will be used. The torsion viscosimeter of Schwaiger is a suitable instrument for measuring this resistance.

Refractive Indices at Low Temperatures—by Aristid V. Grosse, before petroleum division am. chem. soc., Rochester, 1937.

Refractive indices are usually determined at room temperature. Although a fairly large number of substances have been measured above room temperature, measurements below 0 deg. are extremely scarce.

By refluxing any liquid boiling between 0 deg. and -50 deg., using dry ice as a cooling agent and making a few minor adjustments, the well known Abbé refractometer can be readily adapted for low temperature measurements.

A table is included giving some results in the organic field. The differences of refractive indices in closely boiling substances are in some cases so large (for instance, n- and i-butane, butanes and butenes, butenes and butadiene) that they can be readily used for the quantitative determination of the respective compounds.

PETROLEUM SUBSTITUTES

Agrol Gasoline—E. L. Barringer, in natl. petrol. news, vol. 29 (1937), No. 35, pp. 25-28.

The plant financed by the Chemical Foundation at Atchison, Kansas, for the production of absolute alcohol for motor fuel purposes has now begun to distribute its product. The primary product is called agrol, which is essentially a denatured alcohol containing 78 percent of absolute ethyl alcohol, a small quantity of gasoline, with coal tar products making up the rest. This agrol fluid is blended by wholesale oil marketers with commerical gasoline to produce the finished motor fuel, of which there are three grades. Agrol 5 contains 5 to 7.25 percent of agrol fluid; Agrol 10 contains 7.25 to 12.25 percent, and Agrol 15 contains 12.5 to 17.5 percent. Agrol 5, containing 5 to 7.25 percent of agrol fluid which itself contains 78 percent of alcohol, is apparently the most popular at present, and generally sells at the same price as second grade gasoline or at a slight premium. At present about 250 service stations are distributing the agrolized gasoline in the states of Kansas, Nebraska, Iowa, Missouri, Minnesota and the Dakotas. From September to June the plant at Atchison has produced 189,700 gal. of agrol fluid. Such complaints as have been heard about the new fuel relate to a tendency to vapor-lock.

Synthetic Gasoline Factory of Ste. Kuhlmann á Harves—anon. ind. du petrole, vol. 5 (1937), No. 8, p. 19.

This is an account of a visit of delegates to the 1937 World Petroleum Congress to the plant of the Societe Courrieres-Kuhlmann, where the manufacture of synthetic gasoline from water-gas (Fisher-Tropsch process) was inaugurated in June, 1937, with a capacity of 20,000 tons a year.

This factory was originally established to manufacture methyl alcohol, synthetic ammonia, sulphuric acid and ammonium sulphate from coal gases produced by neighboring coke ovens. However, following on the demonstrated feasibility of the Fisher-Tropsch petroleum synthesis it was decided

to reconstruct the works for artificial gasoline production, especially in view of the high French tariff on imported gasoline on the one hand and the absence of excise taxation on motor fuel of domestic production, on the other hand. Thus favored by the prevailing fiscal conditions, the owners of the factory have seen their way clear to assume the full cost of installation without any governamental subsidy, and to sell the product at the ordinary market price in France.

(Note—As the writer remarks, it is no trick at all to manufacture synthetic gasoline if you neglect considerations arising out of cost of production, but even this can be ignored if you are behind a sufficiently high tariff wall. To those who continually insist on the lack of economic justification of artificial gasoline, the *entrepreneurs* who are in this fortunate position can retort that economics are what the government makes them.—Ed.)

USE OF PETROLEUM

Production and Industrial Application of Hydrocarbons Oxidized in the Gaseous Phase—W. de Piotrowski and J. Winkler, before SECOND WORLD PETROLEUM CONGRESS, Paris, June, 1937.

Oxidation of hydrocarbons in the gaseous phase is a field that has been little explored. So far as the authors know, the only industrial plant (aside from the Ste. Petroliere "Galicja") operating in this line is that of the American K. Fries Company which is exploiting the patents of Prof. H. J. James and produces an alcohol-denaturant called "aldehol".

In the authors' plant the industrial oxidation of hydrocarbons in the gaseous phase is carried out as follows: a mixture of hydrocarbons having an average density of 0.800 and a boiling range of 170 deg. to 250 deg. C., is passed through heat exchangers to bring its temperature to 150 deg.; it is then sprayed into a current of air having a temperature of 300 deg. C., the oil vapors and air being mixed in a calculated ratio. The hot mixture, which is now entirely gaseous, is passed into a specially constructed chamber containing the catalyst. The reaction is exothermic, but by suitable cooling does not result in complete combustion, the percentage of CO_2 and CO formed not exceeding 1 to 1.5 percent. Beyond the catalyst chamber the vapors are successively deprived of heavy resins, tarry matters, and condensible products; the incondensible gases supply the necessary fuel.

Four principal products are obtained, comprising three fractions with boiling ranges of 50 to 100, 100 to 200, and 150 to 250 deg. C., and a solid resin with a density of 1.1 and a melting point of about 60 deg. C. There appear to be six principal reactions: (1) A conserving dehydrogenation, (2) a conserving oxidation, (3) a destructive dehydrogenation, (4) a destructive oxidation, (5) a dehydrogenation-polymerization, and (6) an oxidation-polymerization.

The following classes of chemical compounds have been identified: unsaturated hydrocarbons with one or two double bonds, aromatic hydrocarbons, saturated and unsaturated aliphatic alhydes, saturated and unsaturated ketones, lactones, and small quantities of carbonic acid, phenols and peroxides. The heaviest and the lightest fractions are richest in oxygen.

This plant has been functioning for several years, with a monthly output of 40 tons of commercial products. These include:

I. Products for odorizing odorless gases (malodorants) which are incontestably superior to the mercaptans heretofore considered for this use. These are aldehydes of a penetrating odor that is perceptible in concentrations of 0.2 to 0.3 gram per 100 cubic meters. This malodorant is on the market as "Detektol 0 Spec."

II. Alcohol denaturant sold as "Denoxal", the presence of which is perceptible in concentrations of 1 : 10,000,000; 0.1 percent is sufficient for complete denaturing. It has been accepted by European alcohol administrations, whose requirements are much more severe than those of the United States.

III. Anti-clogging agents for illuminating gas lines (fraction 3), which are now the principal industrial application of the products of this factory. The products, in question are much superior to tetraline which has heretofore been used for keeping gas pipes clear of naphthalene. The new product is sold as "Denoxol-Salve" which not only dissolves naphthalene, but also inhibits formation of gums and resins, and redissolves those already formed, besides serving as a rust preventer; it also is free from sulphur.

IV. Sulphonated oils, which serve for the manufacture of hard water soap.

V. Anti-knock agents for Diesel fuels, and lubricating oil improvers. Addition of one percent of the heavy product of this reaction greatly increases the oiliness of a lubricant without diminishing its resistance to oxidation.

Some dozens of catalysts have been tried out, but so far none has been found that will allow the production of only a single product, although one has been found that permits the use of a maximum of air at the lowest possible temperature (260 deg. to 300 deg. C.).

Machine to Test Oils and Bearings—J. Prevost, before SECOND WORLD PETROLEUM CONGRESS, Paris, June, 1937.

The author describes a new type of friction meter which consists of a bearing mechanism or a disc of annular tracks. Two tracks or rings receive a rotation movement from two concentric shafts and tend to entrain in their movement a ring situated between them. The lubricant is poured, drop by drop on this ring. The different friction forces which are exerted are measured by means of a manometer; the apparatus is further provided with a device for recording the revolutions, a tachimeter and a thermometer. The three principal friction factors can vary between the following limits:

Temperature from –20 to 200 deg. C.
Pressure 0.3 to 100 kg/cm^2.
Speed 1-1700r revolutions per minute.

This apparatus enables tests to be made on lubricants, anti-friction metals and allows measurements to be made of the wear of metals. The author describes a mathematical study of the machine: the determination of the couple and of the coefficient of friction. Results of laboratory tests are also given.

In order to facilitate the interpretation of the tests carried out on these machines, the author describes a graphical process which, with a limited number of tests, enable the results of tests on oil or friction metal to be condensed into a very simple and complete nomogram.

Cracked Gas Oils for Diesel Fuels—Harold Bottomley, in REFINER, vol. 16 (1937), No. 9, pp. 424-425.

Classification for diesel fuels for low-, medium- and high-speed engines is vague, as may be seen by comparing various engine manufacturers' recommendations, Each manufacturer apparently knows the type or types of fuel that will perform most satisfactorily in his engines, but these same fuels may behave atrociously in another make of engine of the same speed rating. Much depends on the type of injection system, style of combustion chamber, and other factors.

Be all this as it may, the refiner or marketer of diesel fuels is solely interested in supplying the fuel of the desired characteristics with a minimum of difficulty and a maximum of profit. To attain this important end it is imperative that a fuel made from the cracking process or a blend of this fuel and straight run material or a fuel doped to meet requirements, be supplied. It is more or less general knowledge among refiners that cracked gas oil can be used very effectively in certain types of diesel engines. Rather than attempt to market diesel fuels unsuitable for satisfactory operation the author made an investigation by means of engine tests on diesel fuels of different properties, among them cracked gas oils. He reaches the conclusion that while all diesels may not operate satisfactorily on all cracked gas oils, most diesels will do so, and he recommends that diesel operators investigate the matter. It is indicated that those able to replace their straight run gas oil fuels by cracked fuels may effect considerable savings. For example, a plant operating 1,000 H. P. of diesels will save in the neighborhood of $3,000 a year by so doing.

Phenomena Affecting the Stability of Fuel Oils—J. Herbrich, before SECOND WORLD PETROLEUM CONGRESS, Paris, June, 1937.

The question of sedimentation in fuel oils is of considerable importance to the uses of such oils, and the matter of ascertaining in advance the tendency of an oil to deposit solid matter that would clog pipes has a corresponding interest. Various methods of studying this tendency have been proposed but the matter is a difficult one to standardize because of variations in the natures of fuel oils.

In this connection the author calls attention to the use of the miscroscope. By heating an oil to 88 deg. C. for a certain length of time and periodically examining small portions under the miscroscope it is possible, by observing the time of appearance and rate of growth of separated particles, to draw conclusions as to the stability of the oil, and the probable amount of sediment it will deposit after a longer period at the same temperature.

Knock Rating of Motor Fuels—H. W. Best, before AM. CHEM. SOC., Rochester, 1937.

Knock rating a fuel is essentially a comparison of the knock intensity produced by it with that produced by a reference fuel, these intensities being measured according to a specified procedure. The primary reference fuels are normal heptane and iso-octane (2, 2, 4 trimethyl pentane). The procedure is the A.S.T.M. procedure, which is the result of comprehensive road tests conducted by the C.F.R. Committee at Uniontown, Pa.

These road tests showed definitely that the knocking characteristics of fuels vary with changes in operating conditions. Thus two fuels which are alike in knock intensity when used in one car may vary considerably in this respect when used in another.

The difference between a knock rating of a fuel made by the research me hod and one made by the motor method has been called the sensitivity of that fuel. This is a measure of the susceptibility of the fuel to a change in the operating conditions introduced relative to that of the reference fuel. It does not necessarily indicate the response in knock intensity to any variable.

Variables which can be used to affect knock ratings are engine speed, mixture temperature and spark timing. Variables which seem to have an effect on the precision of knock ratings are humidity, carbon accumulation and knock intensity.

Choice and Use of Transformer and Switch Oils—H. Richter, before SECOND WORLD PETROLEUM CONGRESS, Paris, June, 1937.

Characteristics of a satisfactory oil for transformers and switches is now pretty well understood, and are assured by carefully drawn specifications. Considering the great importance of uninterrupted service of large power plants, especially in the case of great electric works supplying light and power to large populations, it is essential that no failure of the oil in transformers and switches occur to cause shutdowns.

The matter is not settled when the manufacturer delivers a perfect transformer or switch oil to the power installation; the user must take up the duty of seeing that the oil retains its virgin character to the fullest possible extent, and to take appropriate measures to forestall damage from eventual deterioration. In the first place the oil must be carefully

dried before being put in place. Dried oils sometimes contain water that becomes free at the transformer or switch temperatures; the appearance of such water must be watched for by periodic tests; any oil that again becomes moist after drying is to be regarded with suspicion. At the same time tests must be made to note the progress of the alteration that inevitably occurs from temperature and action of air. The limit to the useful life of a transformer or switch oil is given by an acid number of 1.5 or a saponification number of 3.0. Further, if a sediment or precipitate is noted, the oil must be changed. Better still is to make periodic gum tests, and to change the oil before the gums have begun to precipitate. Also, the ash content of the oil should not increase in use; it is a sure sign of action of the oil or its decomposition product on the surrounding apparatus.

All these measures are aimed at keeping the insulating property of the oil (dielectric resistance) above 80 KV/cm. Such control indeed costs something, but the cost may be only expressed by small fraction of the loss and expense caused by a breakdown.

METHODS OF RATING DIESEL FUELS—P. H. Schweitzer, before AM. CHEM. SOC., Rochester, 1937.

The purpose of the paper is to present a critical discussion of the more important methods for rating diesel fuels as to their ignition quality. Of the three groups of tests methods—bomb, engine, and physicochemical—the engine method based on the measurement of the ignition delay was the most convenient, reproducible, and valid. Maximum rate of pressure rise as an ignition index as lacking in reproducibility the misfire in convenience, and the bomb and physicochemical methods mainly in validity. For indicating the ignition delay of the fuel, the magnetic pickup type of instrument, pioneered by Penn State, has found favorable acceptance.

By investigating the influence of engine operating conditions on the ignition quality of the fuel as expressed in cetane numbers, it was found that the cetane rating is remarkably insensitive to the type of engine and operating conditions and also that the laboratory rating correlates well with service engines as judged by running smoothness, ease of starting, and resistance to misfire.

The shortets ignition lag was measured on pure cetane at 24:1 compression ratio, 200 deg. F. intake air temp. and 9 inches Hg. supercharge as 4.8 deg. crank angle corresponding (at 900 r.p.m.) to 0.9 millisecond.

ASPHALT AND TAR

HYDROGENERATION OF TARS AND TAR OILS—J. C. King and C. M. Cawley, before SECOND WORLD PETROLEUM CONGRESS, Paris, June, 1937.

An increase of temperature accelerates the rates of both hydrogenation and cracking reactions, but decreases the maximum degree of hydrogenation possible. The effect of increased pressure on the reaction is somewhat complicated but it was particularly noticeable that there was catalyst deterioration at higher pressures.

For the production of gasoline from tars, hydrogenation must usually be effected in two stages—in the first of which the greater part of the reaction is in the liquid phase. The second stage is a vapor phase reaction. In comparing the molybdenum catalysts used, it was found that the pelletted material was more active than molybdenum catalysts supported on alumina gel, but deteriorated much more rapidly.

Results are given for the vapor phase hydrogenation of vertical retort tar and tar distillates.

It is finally concluded that the lower the temperature of carbonization the greater is the amenability of the tar to treatment by hydrogenation. Vertical retort tars are more suitable for hydrogenation than other high-temperature tars and tar distillates are more readily treated than the tars from which they are prepared.

A short description is given of small plants with throughputs of 12 ml. per hour and 200 ml. per hour respectively. A semi-technical plant with a throughput of 900 to 1,800 kgs. per hour of tar or oil was developed and the design and successful operation of this are described, together with the results of a typical experiment.

GENERAL

PROGRESS OF THE WORLD AUTOMOBILE INDUSTRY—Launcelot Owen, in PETROLEUM TIMES, vol. 38 (1937), No. 969, pp. 176-177.

Quoting figures issued by the Bureau Permanent International des Constructeurs d'Automobiles, and from other sources, the author gives the number of motor vehicles now operating in the principal countries, with special reference to the percentage increases. On this showing it appears that the use of automobiles is increasing at the fastest rate (43.6 percent) in Russia, where the number of motor vehicles of all kinds in 1936 was 352,820 against 245,600 in 1935, thus raising the present number of cars per 1,000 population to 2.1. Other percentage increases and cars per 1,000 people are: Jugoslavia 23.3 percent (1.0), Latvia 18 percent (2.4), Germany 17.4 percent (18.5), Esthonia 16.5 percent (3.9), Northern Ireland 15.4 percent (33.7), Hungary, 11.8 percent (1.9). The increase in the United States was 7.1 percent, bringing the number of vehicles per 1,000 inhabitants to 206.6. In all other countries (not individually named in this abstract) the increase was less than 10 percent. The only country to register a decrease in number of cars in operation was Poland, which now has only 0.8 car per 1,000 population.

The report concludes with the observation that the progress of the world motor industry, on the whole, was inferior to that during 1935. In the view of the reporter, progress of the industry is impeded by vicious and excessive taxation and restrictions.

FLUID COUPLINGS AND THEIR APPLICATION TO OILFIELD EQUIPMENT—L. S. Dawson, before SECOND WORLD PETROLEUM CONGRESS, Paris, June, 1937.

A fluid coupling is a device in which the driving shaft (input member) imparts kinetic energy to a confined body of oil which in turn transfers this energy to the driven shaft (output member). The outstanding advantages are:

A perfectly smooth take-up of load is obtained simply by accelerating the engine, which is thus allowed to pick up the load gradually while running.

It is impossible to stall the engine however much the load is increased, since the effect of an overload merely pulls down the speed, with the result that the driven shaft can actually be stalled under full torque while the engine continues to run at full speed.

Since the power is transmitted by the kinetic energy of the oil circulating within the working circuit it is not possible for torsional vibrations to be transmitted from the engine to the driven machinery, or vice versa; the fluid coupling is thus a perfect cushioning medium.

There is an absence of frictional wearing parts requiring replacement within the fluid coupling; in addition its unique value as a shock absorber reduces wear, tear and maintenance throughout the engine and transmission.

Finally, the transmission efficiency is very high being the inverse of slips, i.e., about 96 to 97 percent in most applications.

Although fluid couplings are in common use for driving variable speed centrifugal pumps, compressors, rail cars, excavators and numerous other motor driven machines having high inertia, their application to oilfield equipment is comparatively recent; in fact, American technical publications on oilfield installations as yet contain no mention of them. The first such installations have been in connection with Diesel driven rigs, in which they completely eliminate torsional vibrations. Other applications are to slush pump drives and to drawworks drives. Here the fluid coupling shows its outstanding ability to take heavy mechanical shock loads, the whipping of slack drawworks chains and the heavy snatch of this slack when reversing. Further, it gives synchronized gear shifting, and maintains driving torque during the gear shifting interval; clashing of gears is impossible.

REDUCTION OF EVAPORATION LOSSES IN TANKS FOR LIGHT STOCKS—H. H. Radier, before SECOND WORLD PETROLEUM CONGRESS, Paris, June, 1937.

Originally the fixed cone-roof tanks were executed with riveted roofs. This construction not being gastight, every pressure variation inside the tank caused gas leakage.

The first improvement consisted in welding the roofs, by which a gastight construction could be obtained. Reduction of the breathing losses, caused by daily temperature fluctuations, could then be obtained by allowing a certain over-pressure and vacuum in the tank.

A logical further development was the increase of the permissible pressure variation. With small alterations in tank construction, involving an increase of cost of only 1,000 francs for a 36 m. diameter tank, under tropical conditions the breathing loss of a gasoline of 5 lb. Reid/10 deg. F. could be reduced from 0.107 to 0.055 ton/m² liquid surface/year by increasing the pressure variation from —6 to +5 cm. to —20 cm. water.

Besides breathing losses there are also evaporation losses caused by manipulation, viz. filling and emptying the tank for a gasoline of 9 lb. Reid/100 deg. F. they vary under tropical conditions between 0.12 — 0.23 percent by weight of the quantity pumped.

Manipulation losses can be reduced by interconnection of the vapor spaces of the tanks. Effect of mere interconnection may be considerable. For further reduction of evaporation losses a gasometer or a gasoline extraction plant (or both) may be added.

When using tanks with pressure roofs resistant to higher pressures, as mentioned above, costs of interconnection are appreciably lower.

SULPHURIC ACID FROM REFINERY GASES—F. L. Craise and E. S. Brown, before SECOND WORLD PETROLEUM CONGRESS, Paris, June, 1937.

For the particular conditions formerly existing in and near El Segundo refinery, recovery of hydrogen sulphide from cracking plant gases and subsequent conversion so sulphuric acid offered an attractive opportunity to eliminate the possibility of noxious fumes while at the same time reducing the operating costs of the refinery. Modern liquid purification processes are available for use in this operation. Suitable equipment has been designed for gas purification and for transporting, measuring and analyzing the hydrogen sulphide recovered from the foul gases. Equipment and operation have been so planned as to practically eliminate the hazard of gas poisoning involved in the operation. Operation of the plant has been satisfactory and no serious difficulties have been encountered in conversion of hydrogen sulphide to sulphuric acid.

WHEN SHOULD TUBES, VALVES AND FITTINGS WORKING UNDER HIGH PRESSURES AND TEMPERATURES BE SCRAPPED?—H. Th. van Houten, before SECOND WORLD PETROLEUM CONGRESS, Paris, June, 1937.

When material is purchased it is required to conform to certain established specifications as regards quality, composition and strength. The specifications are often of a stringent character and are referred to as a basis for acceptance or rejection of the offered equipment.

After the equipment has been installed it is exposed to the action of raw materials and products

that are often corrosive, a condition which acts to reduce the metal thickness of pipes, valves, fittings, and other categories of apparatus; and as the parts thus lose in thickness the danger of accident increases, especially under working conditions involving high temperatures and pressures.

Many industrial plants recognize this hazard and make more or less systematic inspection to determine the approach of failure. For this inspection some more or less arbitrary limits are set up, as for example that pipes, valves and fittings are to be scrapped when 50 percent of the original wall thickness has gone. The objection to such arbitrary limits is that they ignore temperature and pressure conditions, with the result that the equipment is often kept too long in service; on the other hand when the limit is too restricted full service is not obtained.

With the idea of affording plant inspectors some rational guidance in the matter the author, who is an engineer of the Bataafsche Petroleum Mij., has constructed graphs showing safe minimum thicknesses of the walls of tubes, valves and fittings constructed from the principal classes of steel used in refinery work under wide ranges of temperature and pressure. These graphs have the merit of saving an enormous amount of labor that would otherwise be necessary if the inspector has to figure the limits in each particular case, and their use should greatly add to the efficiency of this important service.

One Way of Finding Oil More Cheaply—Parker D. Trask, before AM. PETROLEUM INSTITUTE, Chicago, November, 1937.

Many millions of dollars are spent each year in trying to locate new oil fields. Adequate knowledge of source beds would materially lessen this cost of finding new pools. Source beds are rocks in the ground that contain the materials which generate oil; hence, in drilling for oil it is highly advantageous to know if source beds are present. The American Petroleum Institute since 1926 has been supporting a research project whose object is to develop adequate tests for recognizing these mother substances of petroleum. At present a very promising test has been found. It is called the nitrogen-reduction ratio, and is the ratio of the nitrogen content of rocks to the amount of chromic acid the rocks can reduce. Rocks that have low ratios seem much more likely to be source beds than those with high ratios. This ratio, however, is not an absolute test of source beds; but, as indicated by studies of rocks in Oklahoma and Kansas, it seems to be at least 65 and probably 75 per cent efficient. The ratio is being investigated intensively at present to understand more fully its usefulness and limitations.

Depth Range of Oil Production in the United States—L. J. Logan, in OIL WEEKLY, vol. 87 (1937), No. 1, pp. 13-14.

Although crude oil is being produced in the United States from the grass roots down to two miles, most of the production is coming from depths within a considerably narrower range.

The formations lying between 1,000 and 7,000 ft. currently furnish 92.5 percent of the total crude oil production in the United States. From depths less than 1,000 ft. the country obtains only 1.7 percent of its oil; and from depths greater than 7,000 ft. only 5.8 percent.

Even within the interval from 1,000 to 7,000 ft. there is a concentration of greater production around middle of the interval; while at the shallower and deeper extremes, the production feathers out.

Thus a narrowing down of the producing zones to those between 2,000 to 6,000 ft. still leaves 72.5 percent of the United States production; for the wells from 1,000 to 2,000 ft. furnish only 11.8 percent of the country's output, and those from 6,000 to 7,000 ft. only 8.2 percent.

Within this interval from 2,000 to 6,000 ft. there is a further concentration of largest production around the middle, while the upper and lower sections are less productive.

Thus the division between 3,000 and 4,000 ft. is the most prolific of all the 1,000-ft. intervals from the surface on down, yielding 32.4 percent of all production. In the week ended August 21, 1937, United States crude oil production averaged 3,731,050 bbl. daily, and of that amount, 1,208,150 bbl. was from wells 3,000 to 4,000 ft. deep. Within the 3,000-4,000 ft. intervals lies the pay sand of the East Texas field, which alone produces around 475,000 bbl. of oil a day.

The 1,000 ft. intervals immediately above and immediately below the 3,000-4,000 ft. section produce considerably less than that most prolific zone, but are the next best producing intervals. Wells from 2,000 to 3,000 ft. deep furnish 15.7 percent of the total United States production, and those from 4,000 to 5,000 ft. deep, 13.8 percent.

The wells, 5,000 to 6,000 ft. deep also are fair contributors.

Unfreezable Oil—P. Panoff, French patent 814251, June 19, 1937. (REV. PETR. No 751, 1937).

A product called "strato oil" consists of a solution of chlorinated paraffin in castor oil along with certain glycols, the whole being dissolved in a long-chain keto-alcohol. The following example is given:

	Parts
Propane diol ($CH_3.CH_2O\text{-}CH_2OH$)	15
Methyl pentanol ketone ($CH_3.COH.CH_2CO.CH_3$)	33
Chlorinated paraffin, 33 percent Cl	5
Castor oil	45
Iso-amyl alcohol	2

The propane diol should be free from glycerine and its isomer, propane diol-1.3. The chlorinated paraffin should be neutral and contain no free chlorine. The keto-alcohol should contain no acetone and boil at 163 deg.-164 deg. C. The castor oil should be first pressing, neutral, and contain no other glyceride. The iso-amyl alcohol should boil between 138 deg. and 140 deg. C.

The glycol should first be mixed with the keto-alcohol followed by the chlorinated paraffin previously mixed with the castor oil. The mixture is completed by addition of the iso-amyl alcohol.

Oil Well Performance: A Discussion and Proposed Terminology— B. P. Kantzer and E. G. Trostel, before AM. PETROLEUM INSTITUTE, Chicago, November, 1937.

A compilation of terms used in oil-well performance measurements and calculations has been developed, and discussions which explain and qualify these terms are included. An attempt has been made to select terms in common use, deviating from them only when so required in order to avoid confusion. No attempt has been made to include terms used in reservoir flow, tubing or annulus flow, or in mechanical lifting methods. A table of the proposed terms, symbols, and definitions is appended.

Electrical Equipment for the Petroleum Industry—W. G. Taylor (Compiler) before SECOND WORLD PETROLEUM CONGRESS, Paris, June, 1937.

The joint authors of this paper, who are petroleum industry specialists on the staff of the General Electric (U.S.A.) industrial department, having outlined some of the principal electrical developments for drilling, well pumping, pipeline transportation and refining. The modern Diesel-electric drive for rotary rigs is described, and the unusual characteristics of a new rig-lighting generator are explained. For well pumping, small splashproof or explosion-proof motors or gear motors have superseded the well-known two-speed oilwell motor.

In pipeline pumping station service synchronous or induction motors are used for crude or gasoline pipelines and motor-driven booster pumps can be applied to maintain full line pressure the year around. Where central-station power is not available, the Diesel-electric pumping station has many favorable aspects.

Arc-welding operations are discussed in detail for all branches of the oil industry. Refinery motors and control, including both outdoor and explosion-proof types, dead-front control unit assemblies, and prevailing control practices are quite thoroughly covered. The paper concludes with a brief discussion of refinery power economics, high pressure steam turbines, and central station tie-in for purposes of power balance and continuity of service.

RESERVES

Russian Oil Reserves—I. M. Gubkin, before SEVENTEENTH INTERNATIONAL GEOLOGICAL CONGRESS, Moscow, July, 1937.

Russian oil resources are classified in five categories: Prepared (A_1) embracing all horizons and formations that are now penetrated by existing wells; Surveyed (A_2) includes those areas which have been proven but not yet penetrated by a sufficient number of wells; Visible (B), comprising fields on which discovery wells have been sunk but which have not yet been completely outlined; this also includes deep horizons under producing areas that may eventually be tapped by deep drilling; Assumed (C_1) includes areas adjacent to producing fields or fields that are under survey and which are suspected of containing petroleum on geological evidence; and Possible (C_2), which are reserves for the existence of which there is more or less doubtful geological evidence. In all the nine districts stretching from the Caucasus to Sakhalin Island these various categories add up as follows:

A_1 and A_2	230,700,000 tons
B	652,000,000 tons
C_1	2,994,500,000 tons
C_2	2,499,100,000 tons
Total	6,376,300,000 tons

(If the most doubtful categories be omitted and "proven" reserves restricted to the categories A_1 B and C_1, then the Russian reserves may be figured at 3,877,200,000 tons.—Ed.)

BOOKS

Energy Sources of the World—Rudolf Regul and Karl George Mahnke; published 1937 by INSTITUT FÜR KONJUNKTURFORSCHUNG, Hamburg; 78 pages; 7.80 R.M.

This brochure gives an extensive summary of the development and economics of world energy sources. It gives statistical data, not heretofore assembled, on the occurrence and supply of wood, water power, petroleum and coal, together with data on current production and exports of coal and mineral oil of all countries.

The figures show that known coal deposits down to a depth of 2,000 meters are sufficient to last 3,730 years at the present rate of consumption, or 217 years if the present rate increases 2 percent a year. Petroleum supplies are estimated as shown in the accompanying table.

As regards competition between coal and water power it is observed that at present the cost of power production by these two energy sources is about equal.

In regions (as in Europe) where the best water power sites have already been developed, the taking in of less suitable sites must be accompanied by an unfavorable cost of production. As regards competition between oil and coal it appears certain that coal will be largely displaced from marine transport and perhaps in certain countries also from rail transport. Whether and to what extent oil will displace coal for industrial and domestic use will largely depend on the future action of taxing authorities; even now taxes are more burdensome than the material cost.

Country	Reserves in tons	Life in years at present rate of production (1935)
World	4,066,000,000	18
Europe, including Russia:	742,100,000	22
Roumania	113,100,000	13
Russia	550,700,000	22
Asia, excluding Russia:	910,600,000	47
Iran	299,000,000	39
Iraq	395,000,000	110
Africa	2,300,000	14
America:	2,408,900,000	14
United States	2,029,300,000	15
Venezuela	235,100,000	11

A factor which is difficult to estimate is progress in the use of fuel. The time is approaching when no raw material, even coal, will be used directly as such, but only after chemical or other transformation that will increase its economy and efficiency.

TESTING METHODS FOR PETROLEUM PRODUCTS, English edition—by E. Molnar and P. A. Graf; Publication No. 7 of the AUSTRIAN PETROLEUM INSTITUTE; 184 pp. VERLAG FUER FACHLITERATUR, Vienna, £1.

This book, the German counterpart of which was previously noted in these columns, is especially designed for the information and use of manufacturers, exporters or other persons to whom it may become of interest to know what tests and methods of analysis are applied to domestic or imported oil products. It may be a disagreeable experience to find that figures obtained for a product that complies with specifications by tests valid in the country of production are not valid in an importing country. And an oil chemist or researcher who reads reports of foreign oil investigations will find it desirable to understand what are the methods by which the results of foreign investigators are checked.

The present volume provides this information. For instance, under gasoline, is given a set of tables listing all the official methods used in each of 21 countries in testing this product. In a separate section these methods are described. The same scheme is followed with kerosene, gas oil, fuel oil and lubricating oil. The work is thus valuable for reference, as it includes some of the principal unofficial methods and gives useful literature references. The compilers have announced their purpose of keeping it up to date by issuing additions and corrections as the need arises.

A.S.T.M. STANDARDS ON PETROLEUM PRODUCTS, 1937—Published by AM. SOC. FOR TESTING MATERIALS, Philadelphia; 390 pages with heavy paper cover. $2.00.

The 1937 edition of the compilation of A.S.T.M. Standards on Petroleum Products and Lubricants, sponsored each year by committee D-2, includes in their latest form the 58 test methods which have been standardized, seven specifications and two lists of definitions of terms relating to petroleum and to material for roads and pavements. Two proposed methods, approved for publication as information and for comment, cover unsulfonated residue of plant spray oils, and dropping point of lubricating greases; the 1937 D-2 report, which is included, also details numerous changes in the standards and gives the revised Diesel fuel oil classification.

ANNUAL REVIEW OF THE CALIFORNIA OIL INDUSTRY—Published 1937 by PETROLEUM WORLD, Los Angeles; 344 pages. $2.

This volume gives a complete conspectus of the California petroleum industry. The reviewer uses the phrase "complete" advisedly; in its wealth of detail it is probably unmatched by any other publication relating to any single oil producing region.

The non-statistical part contains an article on drilling equipment progress by Joseph Jensen, an article summarizing advances in production equipment by S. F. Duncan, and an article on progress in geophysics by Beno Gutenberg. Other articles review the new oilfield discoveries of the year, the natural gasoline industry, the upswing in refinery construction and the market situation.

The major portion of the volume is occupied by statistics which appear to leave nothing of importance uncovered. The history of crude oil production is shown by graphs and by an extensive table showing the yearly and total production of every oil field in California, reaching back to 1876. Another table gives the production, by months, of each field in 1936, and an adjoining table tabulates the monthly stocks of all products, from crude to coke, held in storage on the Pacific Coast by months for the past five years. Then follows a comprehensive table showing oil well completions in California with daily output and dry hole record in each district from 1928 to 1936 inclusive; the figures for 1936 are shown in greater detail. A long series of tables gives the history of crude oil prices in California for each field and for each gravity degree from the lowest to the highest produced in that field; this record runs as far back as 1925. This table is complemented by one showing the average price of California crude oil, by counties since 1894. Still more extensive is a series of tables giving the production record of the major and principal independent companies operating in the state during 1936, showing total production during the year, number and location of producing and idle wells, potential allotment, etc. Operations of all companies are summarized in another large table. Next we are given a view of California oil field data, by major districts and individual fields of which there are more than 200. In each case are given the date of discovery of the field, name of the discovery well, structure and geological age of the field, production, proved acreage, total output, reserves and numerous other details.

A unique and valuable feature of the book is a table, covering 27 pages, entitled "California Dry Hole Record." The purpose of this table is to classify in one reference all wildcat wells in California and thus eliminate the involved search frequently necessary to obtain information about these wells. Here is a record, by counties, of every dry hole drilled in California since the beginning of oil history in that state, showing location, date started, date abandoned, total depth and formation at bottom. Several excellent maps are provided. Finally, an extended discussion is given of the Wilmington field as the outstanding field of the year, the new Santa Maria discovery, the Ten Section field, the Greely discovery and the Padre Canyon field.

California oil men and all others interested in California petroleum will undoubtedly appreciate this work; compilers of reference books for other regions may well take it as a model.

OIL BURNING—by H. A. Romp, published 1937 by MARTINUS NIJHOFF, The Hague; XXIV and 336 pages, with 262 figs. in the text and seven tables; 12 guilders.

This is a book which as a matter of course will find its place on the book shelf of every man who is interested in burning fuel oil or in buying or selling equipment for burning oil for any domestic or industrial purpose.

Like all worth-while books that really cover the subject this one begins at the early stages and traces the historical development of oil burning. This part of the story begins with Russia and takes in early developments in America and western Europe. A remarkable feature is the great profusion of descriptions and drawings of the types of burners and furnaces that have been used for the purpose in a great many countries. Anyone who thinks he has invented something new in oil burners should look through this volume to see whether his idea has been anticipated.

After dealing with the historical aspect of the subject the author reviews the various theories relating to the combustion of fuel oil, which are stated succinctly and clearly. After this section on the basic principles of oil burning comes a section on modern forms of construction of oil burning devices, divided into eleven chapters which touch on about all the known methods of feeding the oil to the burners. The fourth section, with ten chapters, is on the future development of oil burning as it may be foreseen from the pressnt trend of invention and practice.

SYMPOSIUM ON LUBRICATION—Published 1937 by AM. SOC. FOR TESTING MATERIALS, Philadelphia; 89 pages; $1.25, paper; $1.50, cloth.

This symposium was developed by technical committee B on motor oils of A.S.T.M. committee D-2 on petroleum products and lubricants and is a sequel to a similar one held in New York City in 1933. Widespread interest in the subject is evidenced by the considerable discussion, which is included in the publication.

The papers and discussion, herein contained, summarize and bring up to date available information on motor oils and their applications. The symposium is limited to motor car engine lubricants.

The first paper discusses Engine Deposits—Causes and Effects, covering such subjects as combustion chamber deposits, valves, ring clogging and crankcase deposits. The paper on Automotive Bearings—Effect of Design and Composition on Lubricants covers lubricating system design, equipment for testing bearings, design factors and composition of bearing material.

Topics discussed in the paper on Addition Agents for Motor Oils include oiliness agents, pour inhibitors, viscosity index improvers, anti-oxidants, and carbon removers. How to Select a Motor Oil from the Standpoint of the Consumer is covered in the fourth paper which points out factors concerning oil viscosity, rate of replenishment, mechanical failure and contamination.

AMERICANS IN FRANCE, 1937—Edited and published by AMERICAN CHAMBER OF COMMERCE IN FRANCE, INC., 21, Avenue George-V, Paris 8e. Pp. 552; cloth bound, 60 francs net; leather bound, 75 francs net.

To all Americans residing in France and to all who have need of a reliable source of information concerning their names, addresses and business connections, the thirteenth edition of this directory is a unique and up-to-date book of reference.

The scope of the work is best indicated by the list of sections, as follows: officials and organizations; residential directory; commercial directory (alphabetical); commercial directory (classified); general information; and advertisers. Each section is thumb indexed for easy reference.

U. S. S. R.

J. WEGRIN

Official Figures for Soviet Oil Operations

	Crude Production (Bbl.)	Daily Average (Bbl.)	Run to Stills (Bbl.)	Drilling (Ft.)
January	16,117,461	519,918	14,412,330	443,310
February	13,796,325	492,726	12,671,478	359,317
March	15,907,051	513,130	14,375,151	540,510
April	16,401,771	546,722	14,386,086	542,390
May	18,130,230	584,846	16,997,778	591,510
June	17,953,812	598,460	17,144,724	585,182
July	18,580,752	599,379	17,902,782	572,441
August	15,830,000	527,667	14,790,000	520,000
September	16,663,000	537,516	15,100,000	530,000
October	17,600,000	567,742	15,830,000	530,000
Total 10 Months, 1937	166,980,392	549,277	153,775,317	5,214,660
Total 10 Months, 1936	165,044,652	541,130	150,686,487	5,743,769
Total 1936	199,634,921	545,450	180,582,274	6,958,916
Total 1935	184,007,619	504,130	152,783,726	4,858,465
Quota 1937	234,450,000	642,329	208,285,000	9,240,000
Quota 1936	222,345,000	607,500	182,250,000	7,100,000
Quota 1935	221,106,000	605,769	178,605,000	5,214,000

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CORRECTION

In an article dealing with Soviet refinery construction published in the annual refinery review of World Petroleum the author stated that an order had been placed with Lummus Co. for a solvent extraction plant using furfural. This statement is in error. No work of any nature has been done by The Lummus Co. upon furfural plant or process for the Russian refining industry.

THE Soviet Union exported 1,393,000 bbl. of oil products to Spain during the first nine months of the current year, considerably more than the 551,000 bbl. shipped during the first three quarters of 1936. Should all ports of loyalist Spain be successfully blockaded, the market in that country might well be considered as closed to Russia. Such a loss would seem more of a political nature rather than of economic importance, for the Soviet has no surplus for export, and her present needs for gold are not stringent.

Political differences with Italy have recently started the rumor of a Russian threat to cut off oil supplies from Italy—one to which few connected with the oil industry will even give second thought. The Soviet does not number among the important suppliers of Italy, which gets more than half her oil from Roumania. From January through September the total Italian petroleum imports from Russia amounted to 25,744 tons.

A few improvements were noted in the Soviet petroleum industry during September and October. Despite the fact that the statistical position is somewhat better than the previous year it is probable that 1937 will be some 30,000,000 bbl. behind its quota of crude oil output, and 23,000,000 bbl. below plan in run to stills, while there is every indication that footage drilled will be lower than that of 1936.

The Soviet oil industry has been laboring under many difficulties, and like other Russian enterprises has gone through a crucial political purge in which directors of important divisions have been ousted. Their replacement has not brought about the vast improvement anticipated—what progress has been noted would appear to be the customary warm-season speeding-up of drilling, and might possibly have happened even though there had been no changes in personnel or management. Removal of the so-called counter-revolutionists has had its results, for the visit of 1935's Soviet oilfield reconstruction commission to America appears to have been forgotten. While perhaps more reliable politically, the new executives are not any better at living up to plan.

INDUSTRIA, issue of October 27th, reports of the difficulties encountered due to bad weather at Molgabek—discovery of which checked the decline in Grozni production in 1932. Constant rain has rendered the roads impassable, and motor trucks which left Grozni with supplies have become mired. Only tractors would be able to get through, and they have too limited a carrying capacity. Production is about 20 percent below plan. The field's new director, Mr. Riabov, confesses that he found it necessary to discontinue construction of a six story apartment house in order to obtain roofing material to cover rigs and derricks in the field. Failure during the summer to prepare for the cold weather by laying in supplies has created an embarrassing situation—this is not entirely the fault of the oilfield management, for although expecting material to drill 20 wells, during the last three months only sufficient has been delivered for sinking three.

Drilling speed at Molgabek was increased from 5,300 ft. per table month to 9,560 ft. per table month in September, but there is little use in creating greater speed records when out of 15 wells completed only five are producing due to lack of two-inch pipe. There are about 80 idle wells due to lack of some sort of supplies.

Production seems to be on the upward swing at Grozni, where toward the end of September a producer was obtained from 5,600 ft. This was the first obtained in the old oilfields during the past four or five years, indicating the field is by no means exhausted. A second producer was obtained at Gorski mountain, where some eight wells are drilling, with a flow of 2,000 bbl.

(Continued on page 54)

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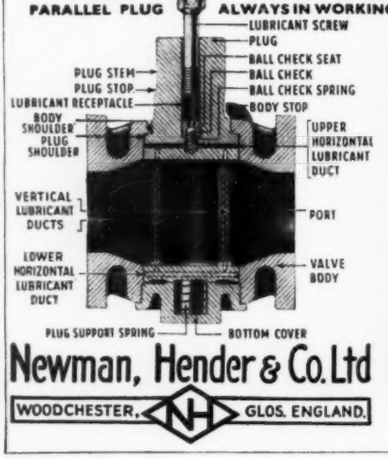

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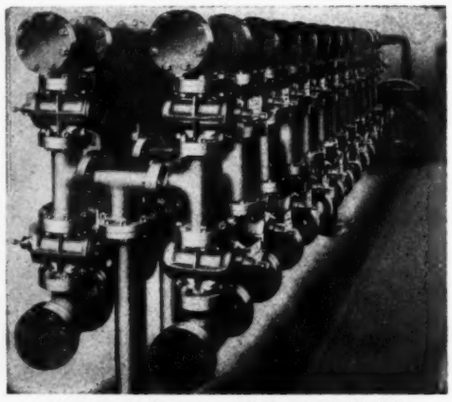


N-M Valves in Service on an Oil Distribution Manifold

(Continued from page 52)

These new wells have improved the Grozni output to the point where it is 82 percent of plan.

Some improvements have been reported from some of the Baku oilfields, especially the Lenin group, where completions have increased the plan fulfilment for the month from two to three percent above the quota.

Maikop also has done well during the month, in the beginning of which the field was almost par and at the end it was three percent above plan. Drilling in that field was indicative of efficiency and distance over a long period of time, and it is now evident that Maikop is reaping the reward of its efforts.

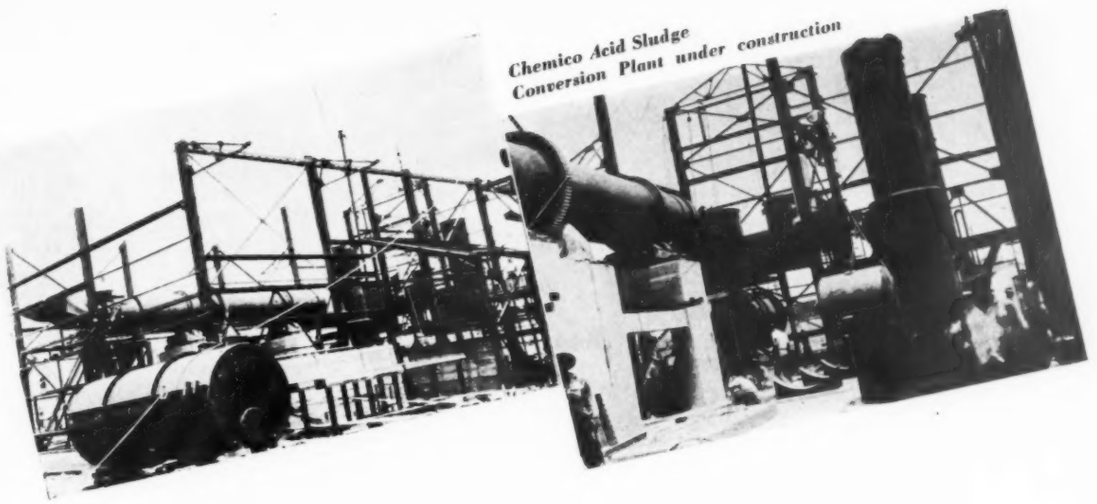
ZA INDUSTRIALIZATIU, No. 131, contains an article by V. Poliakov, assistant head of Glavneft, in which he states that a major change in the geographical distribution of crude production will take place during the Third Piatiletka, to start next January. Although 90 percent of Russia's oil is now derived from within the Caucasus, it is planned that oilfields outside this area shall supply not less than 20 percent during the Third Piatiletka—while the Caucasus output is to increase considerably. Especially will there be efforts to establish the eastern oil base of which Joseph Stalin spoke several years ago, but which never materialized. Poliakov believes that by 1942 Bashkiria will have doubled its 1937 output and that Emba will increase its output fivefold. It is planned that Sizran and Krasnokamsk will be extended to produce not less than 18,225,000 bbl. in 1942, thus increasing the output of the eastern oil base to at least 16 percent of the country's production compared with eight now.

Production of natural gas and casinghead gasoline is to be increased, and stripped gas will be used by refineries for firing purposes instead of oil.

Plans are also being laid for extensive modernization of refining processes and further refinery construction. Every effort will be made during the Third Piatiletka to offset all arrears against plan.

Soviet Petroleum Exports

	January-September	
	1937 (tons)	1936 (tons)
Crude oil	68,438	274
Gasoline	308,252	321,996
Kerosene	183,055	300,344
Lube oil	176,475	208,339
Diesel oil	7,376	45,133
Gas oil	285,077	399,266
Fuel oil	443,379	661,852
Other products	1,846	10,103
Total	1,473,898	1,947,307
Value Rbl.	107,716,000	115,953,000



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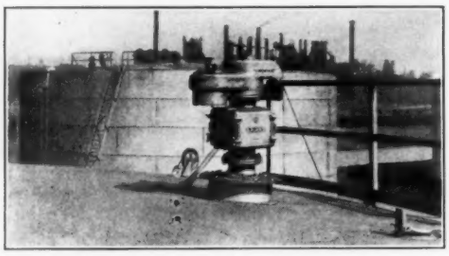

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and see that the distributor acts to produce profits and good-will for the company, too.

Relieving the company of the legal responsibility for the distributor's acts—inducing dealers to change brands by extra long margins on rentals, or new equipment, or construction, or advertising fees, or what-not—was more successful when fewer companies were using the distributor for such purposes. Now, since so many companies conduct their operations that way, dealers shift from one company brand to another, with no net gain by the industry and very little permanent gain by any one company, which loses as many dealers as it gains.

The plan of dual operation—a distributor operating in the same territory as the major company which he represents—has proven unprofitable for the industry and for the companies. Originally started by some companies as a weapon to get business from competitors, such dual distribution prevents the major company from expanding its own direct operations, since the distributor has already offered to any prospective dealer more concessions in price and equipment than the major company would care to have it known that it gives directly to dealers. Not only is expansion by the company prevented, but, in some cases, the company's good dealers whom its own distributor wants, are taken from the major company via a detour through another major company. Such activities result in increased costs to all major companies and to the industry.

Supervision of dealers costs money; the company can eliminate this expense by operating through distributors, but the distributor invariably eliminates the supervision. Dealers are too frequently left entirely to their own devices, and they operate thousands of dollars worth of company equipment without adequate supervision, and use methods of operating the stations, and of selling and servicing the major company's customers, which very seriously detract from the good name and the good-will which the major company has spent millions of dollars and years of effort to create, and are its most valuable assets.

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(Continued on page 58)

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(Continued from page 56)

increased profits are possible only by decreasing expenses or by increasing the volume of traffic.

Similarly, with prices for consumers' petroleum products somewhat constant and with the annual volume of the average consumer's purchases constantly increasing, increased profits can be achieved only by getting 100 percent of each present customer's business, or by decreasing expenses.

SUMMARY

The oil industry is facing today some of the most serious problems it has ever encountered. Subjected to investigations and criminal trials, threatened with regulatory legislation, burdened with tremendous taxes it still must continue to render adequate service to its customers.

Almost exclusively in the marketing field now, do the difficulties with governments occur—those difficulties are mainly confined to problems revolving about the price at which the oil companies sell their products and how such price is determined.

The record of the industry's technical, scientific, and administrative accomplishments in other fields testifies that there is a wealth of executive ability within the industry to evolve constructive, intelligent sales practices, which will avoid conflicts with governmental regulations.

Some companies have initiated constructive sales plans and developed them; these companies are the profit-leaders of today. Many other companies were merely carried along by the industry; now they undoubtedly will be compelled to follow the upward lead of the more progressive companies. A changed mental attitude will doubtless occur in the marketing divisions of the oil companies from which will evolve intelligent, constructive, beneficial marketing programs, thereby avoiding persecution by the government arising from irregular marketing policies.

In the past, there was comparatively little need for the application to marketing of the same type of executive ability which the other divisions received. The primary task of the industry was to supply the products; the public literally grabbed the products away from the companies. Naturally, such a situation required very little attention except to make sure that the outlet facilities were adequately supplied. With the industry's experienced executive ability concentrating on the newer problems of marketing, the industry will present a brighter and improved picture. No longer will the profits made in the production, transportation and refining divisions need to absorb the losses in the marketing division, for it, too, will stand on its own feet and produce increased profits. ■ ■

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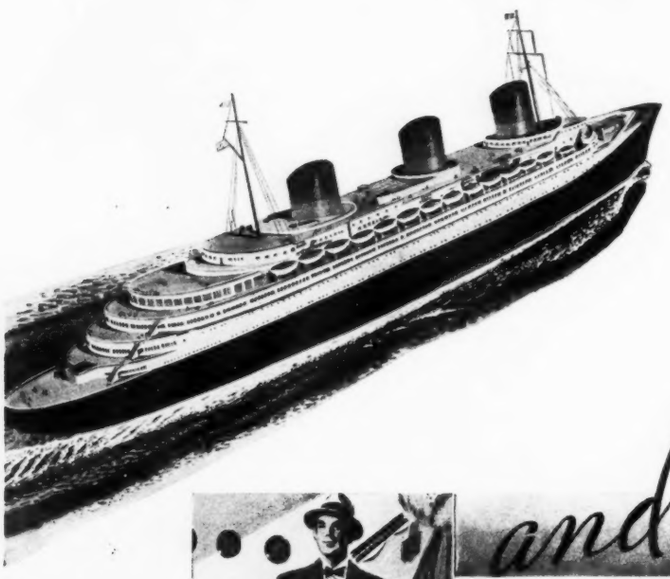

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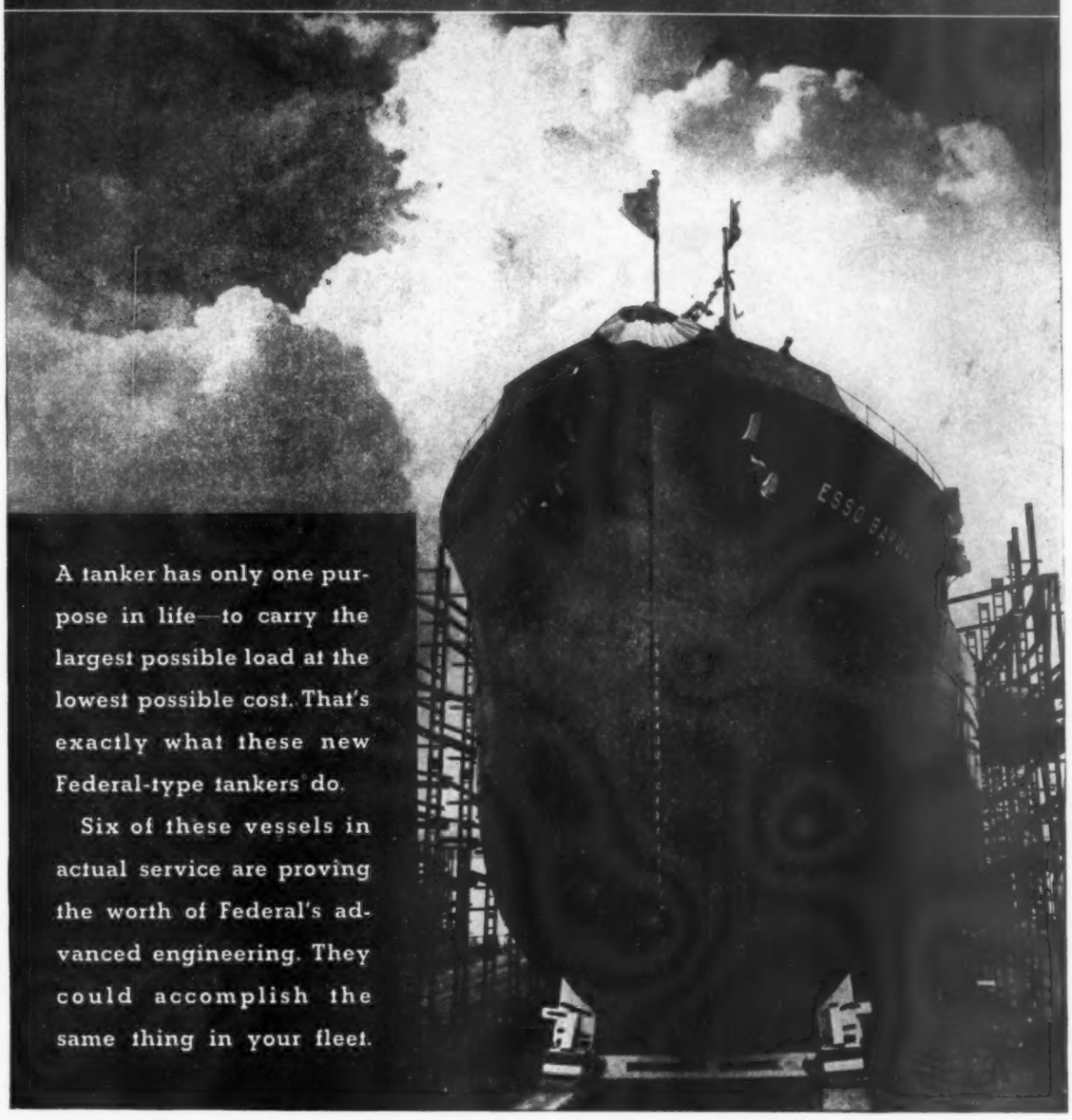

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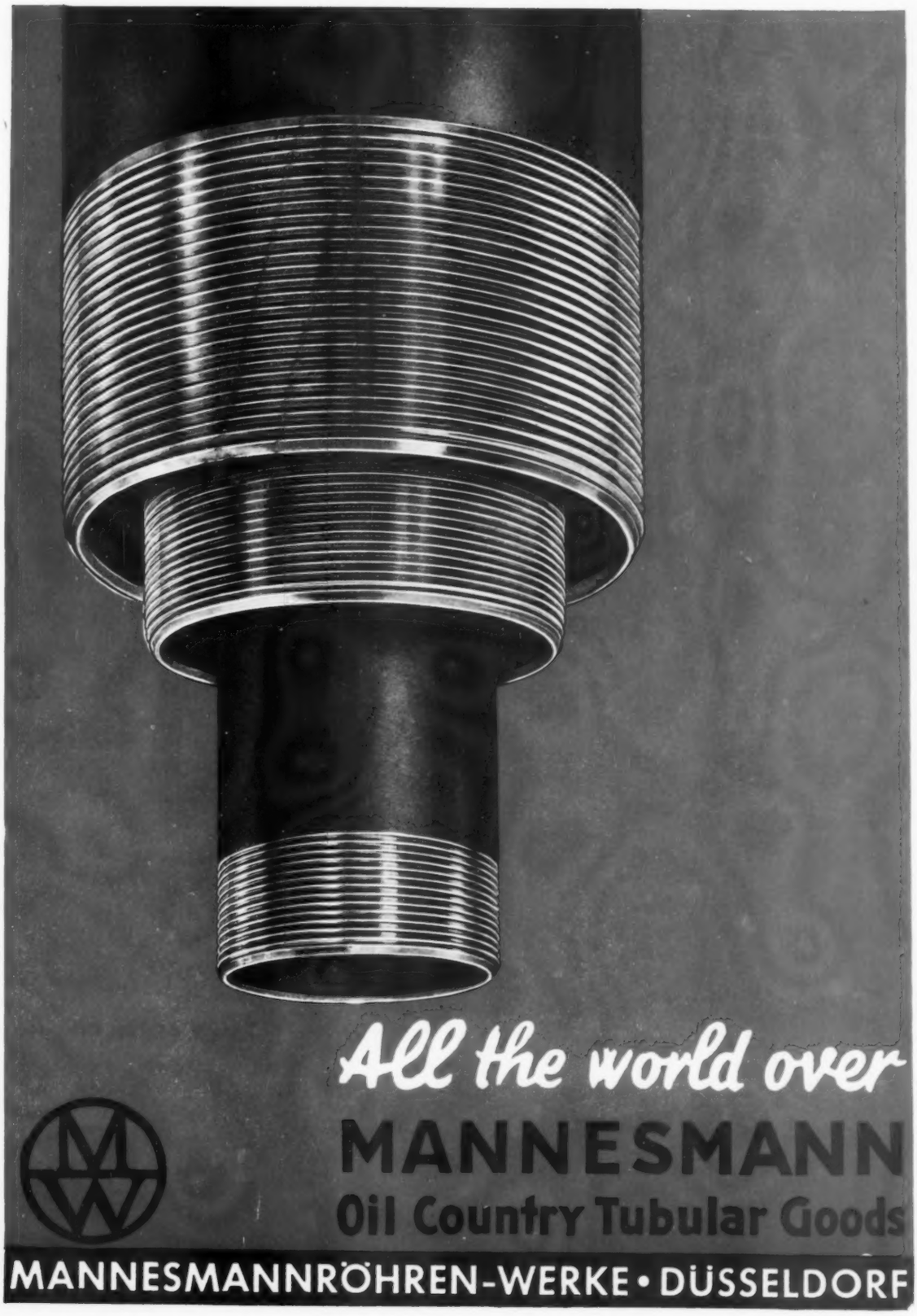
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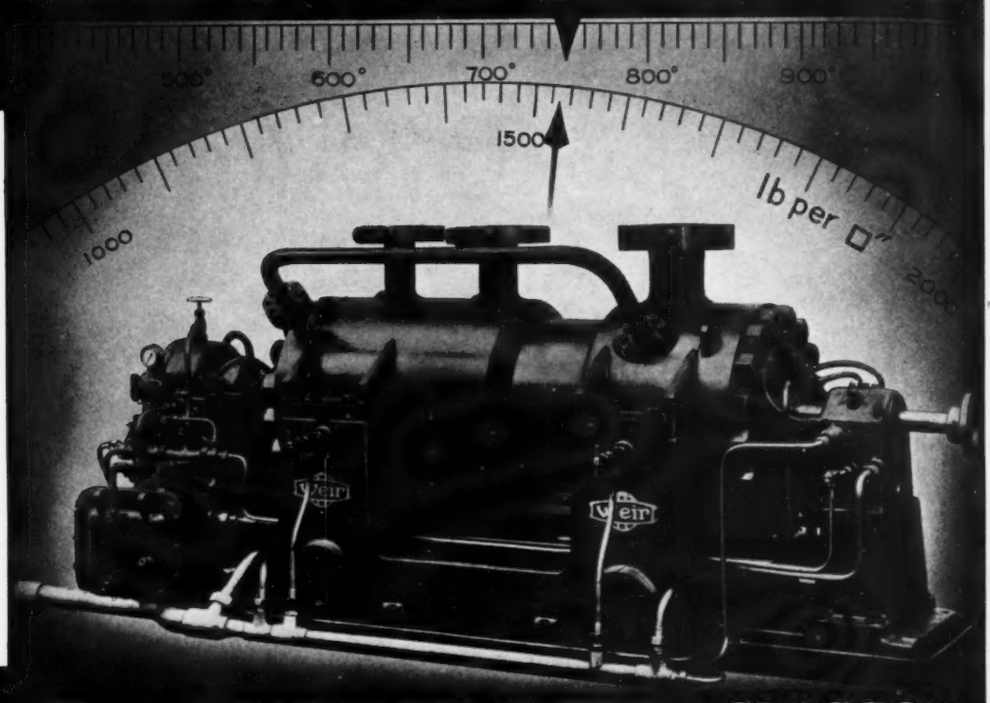

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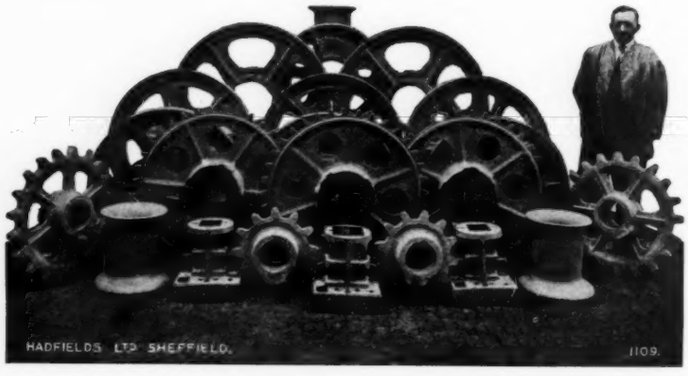

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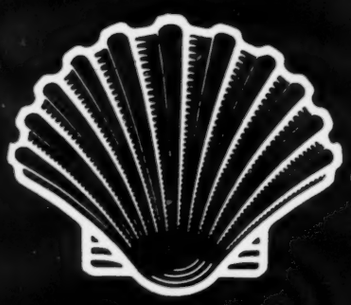

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